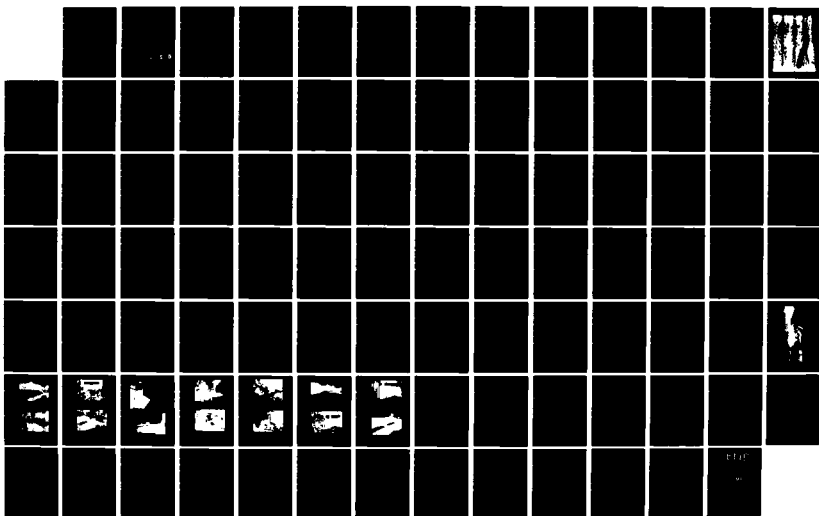


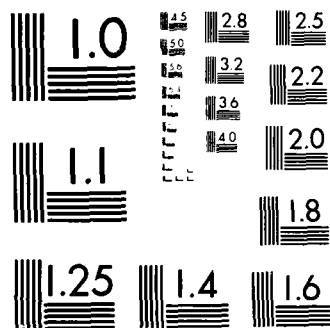
NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
BUCKLEY-DUNTON DAM (M. U) CORPS OF ENGINEERS WALTHAM
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CONNECTICUT RIVER BASIN
BECKET, MASSACHUSETTS

BUCKLEY-DUNTON DAM
MA 00202

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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DEPARTMENT OF THE ARMY

NEW ENGLAND DIVISION, CORPS OF ENGINEERS

WALTHAM, MASS. 02154

AUGUST 1981

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM MASSACHUSETTS 02254

REPLY TO
ATTENTION OF:

NEDED

SEP 11 1971

Honorable Edward J. King
Governor of the Commonwealth of
Massachusetts
State House
Boston, Massachusetts 02133

Dear Governor King:

Inclosed is a copy of the Buckley-Dunton Dam (MA-00202) Phase I Inspection Report, prepared under the National Program for Inspection of Non-Federal Dams. This report is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. I approve the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is vitally important.

Copies of this report have been forwarded to the Department of Environmental Quality Engineering. Copies will be available to the public in thirty days.

I wish to thank you and the Department of Environmental Quality Engineering for your cooperation in this program.

Sincerely,

C. E. EDGAR, III
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

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NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT
BRIEF ASSESSMENT

IDENTIFICATION NO.: MA 00202
NAME OF DAM: Buckley-Dunton Dam
TOWN: Becket
COUNTY AND STATE: Berkshire County, Massachusetts
STREAM: Yokum Brook
DATE OF INSPECTION: June 30, 1981

The dam is a 22 foot high, 370 foot long earth embankment dam with an ungated 35 foot long spillway weir and a manually operated 24 inch main drain. Construction of the dam was completed in 1967. The dam is owned and operated by the Commonwealth of Massachusetts, Department of Environmental Management.

There was no indepth engineering data available for review. Therefore, the adequacy of the dam was primarily evaluated by visual inspection, past performance history and sound engineering judgement. The visual inspection indicated the dam to be in generally fair condition. Indications of seepage were observed at the ends of the training walls, near the downstream toe and at the spillway apron. Settlement of soil was observed under the upstream side of the bridge approach slabs.

The dam has a size classification of intermediate and a hazard potential classification of high. Based upon Corps Guidelines, the test flood, full PMF, inflow would be 4510 cfs, from the 2.2 square mile drainage area. The routed test flood discharge is 2065 cfs. The corresponding surcharge elevation would be 1771.5. The top of dam,

elevation 1771.5, is not overtopped. The spillway has a capacity of 2060 cfs and the test flood outflow would equal 100 percent of the spillway capacity.

The dam is in generally fair condition. It is recommended that the Owner engage a qualified registered professional engineer to investigate and design required remedial measures for the source of seepage found near the downstream toe and training walls; the source of springs flowing out of the spillway apron and the cause of soil settlement under the bridge approach slabs.

The Owner should institute remedial measures which include: maintenance of brush growth on the slopes; cutting of trees and brush constricting the discharge channel; removal of debris from the spillway apron and energy dissipator; repair of the minor erosion adjacent to the approach slab on the left side; repair of eroded concrete at the concrete-stone interface at the left training wall; yearly operation of the sluice gate to insure continued adequacy; backfilling of animal holes; locating and making readily available the design and construction data; instituting of an annual technical inspection program and development of a formal warning system for the downstream impact area.

The recommendations and remedial measures should be implemented by the Owner within one year after receipt of this Phase I Inspection Report.



Ronald H. Cheney

Ronald H. Cheney, P.E.
Vice President

Hayden, Harding & Buchanan, Inc.
Boston, Massachusetts

NOT AVAILABLE AT THIS TIME

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the

condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The Phase I Investigation does not include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

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water up out of the apron. One typical spring is shown in photograph 9. In all springs the flow appeared clear. Some minor debris is present in the spillway apron and energy dissipator.

The spillway weir and training walls were observed to be in generally good condition. There was some efflorescence through shrinkage cracks. The weepholes were observed to be working. There is some concrete erosion at the bottom of the left training wall at the concrete-stone interface.

According to the Department of Environmental Management personnel, the gate for the main drain was operable when last used several years ago.

d. Reservoir Area

There is no indication of slope instability along the banks of the reservoir in the vicinity of the dam.

e. Downstream Channel

The downstream channel, shown in photograph 10, is thickly vegetated with trees encroaching on the channel flow. However, no obstructions were observed in the channel.

3.2 Evaluation

The visual inspection indicates that the dam is in fair condition. The inspection disclosed the following items which require attention.

a. The seepage evident at the downstream ends of the spillway training walls could result in continued erosion of the soils in these

Minor erosion of the soil at the left end of the concrete deck bridge approach slab has occurred (photograph 12). This erosion is probably the result of traffic over the bridge.

Settlement of soil underneath the upstream side of the bridge approach slab has occurred as shown in photographs 13 and 14. This settlement has resulted in a void up to 1 foot deep below the concrete slabs extending 10 to 15 feet from each side of the spillway and up to 6 feet toward the dam axis.

3. Downstream Slope

The downstream face of the dam is sloped at 2H:1V. The slope, shown in photograph 3, is generally covered with brush up to 4 feet tall.

Seepage of about 1 gpm of clear water was observed flowing at the downstream end of the right training wall of the spillway and 1 foot above the channel flow (photograph 8). This appears to have resulted in some erosion of the soil at this location. A similar condition exists at the end of the left spillway training wall, although seepage could not be detected because of the water flowing in this area (photograph 11).

A spongy area was evident at the downstream toe between 25 and 70 feet left of the left spillway training wall.

An animal burrow of about 1 foot deep was found among the roots of the brush growth on the slope about 80 feet left of the spillway.

c. Appurtenant Structures

The spillway apron, shown in photograph 4, is lined with concrete and riprap. Several small springs were observed spurting

SECTION 3
VISUAL INSPECTION

3.1 Findings

a. General

The dam was visually inspected on June 30, 1981. At the time of the inspection, the water level of the reservoir was at the level of the crest of the spillway lower weir.

b. Dam

The dam is an earth embankment with a length of 370 feet a height of 22 feet and a crest width of 28 feet.

A spillway is located in the center of the dam, and a single 24 inch diameter low level drain pipe is located below the right training wall of the spillway. A concrete deck bridge spans the spillway channel.

1. Upstream Slope

The upstream face of the dam shown on Photograph 2, has a slope of about 2H:1V. Above the waterline, the slope is covered up to the dam crest with hand-placed riprap, in good condition. Some brush up to 4 feet tall is growing on the slope.

2. Crest

The dam crest is paved with asphalt between the right abutment and the concrete spillway bridge (photograph 1) and is unpaved between the bridge and the left abutment (photograph 12). No misalignment or cracking of the crest was observed.

inspection, past performance history, and sound engineering judgement. The Owner should locate the design plans and construction data for the dam.

c. Validity

The visual inspection of this facility showed no reason to question the validity of the information supplied on the inspection reports.

SECTION 2
ENGINEERING DATA

2.1 Design Data

No design plans or calculations were located.

2.2 Construction Data

The dam was constructed during 1965 to 1967. No construction data was located for this dam.

2.3 Operation Data

No operational manual exists for this dam.

2.4 Evaluation of Data

a. Availability

The Owner could not locate the design plans or construction data for the dam. State Inspection Reports for the years 1971, 1973, 1975 and 1977 and a County Inspection Report from 1967 were made available at the State Department of Environmental Quality Engineering, Division of Waterways, 100 Cambridge Street, Boston Massachusetts.

b. Adequacy

The lack of indepth engineering data does not allow for a definitive review. Therefore, the adequacy of this dam, structurally and hydraulically, can not be assessed from the standpoint of review of design calculations, but must be based primarily on the visual

(6)	Spillway crest (drop section) -----	1764
	(upper section) -----	1765.5
(7)	Design surcharge (Original Design) -----	Unknown
(8)	Top of dam -----	1771.5
(9)	Test flood surcharge -----	1771.5
d.	<u>Reservoir</u> (Length in Feet)	
(1)	Normal pool (elevation 1764) -----	4000
(2)	Spillway crest pool (elevation 1765.5) -----	4000
(3)	Top of dam -----	5000
(4)	Test flood pool -----	5000
(5)	Flood control pool -----	N/A
e.	<u>Storage</u> (acre-feet)	
(1)	Normal pool (elevation 1764) -----	596
(2)	Spillway crest pool (upper level elevation 1765.5) -----	818
(3)	Test flood pool -----	1958
(4)	Top of dam -----	1958
(5)	Flood control pool -----	N/A
f.	<u>Reservoir Surface</u> (acres)	
(1)	Normal pool -----	139
(2)	Spillway crest (elevation 1765.5) -----	156
(3)	Test flood pool -----	220
(4)	Top of dam -----	220
(5)	Flood control pool -----	N/A
g.	<u>Dam</u>	
(1)	Type -----	earth embankment
(2)	Length -----	370'
(3)	Height -----	22'
(4)	Top width -----	28'

provision for stoplogs or flashboards. The vertical clearance from the top of the upper weir section to the bottom of the bridge deck is 4'-6". The invert of the drop section is at elevation 1764 while the elevation of the upper crest is 1765.5.

2. Maximum Known Flood

Records of maximum past floods or reservoir impoundments were not located.

3. Ungated Spillway Capacity at Top of Dam

Under normal operating conditions, with the 24 inch pipe closed, the spillway capacity is 2060 cfs with the reservoir level at the top of dam, elevation 1771.5.

4. Ungated Spillway Capacity at Test Flood

The spillway would have a capacity of 2060 cfs with the reservoir level at the test flood, elevation 1771.5. The routed test flood outflow of 2065 cfs would equal 100 percent of the spillway capacity.

5. Total Project Discharge at Top of Dam

The total project discharge with the reservoir level at the top of dam, elevation 1771.5 and the drain open, would be about 2115 cfs.

c. Elevation (feet above NGVD - approximate only)

(1)	Streambed at toe of dam -----	1750+
(2)	Bottom of cutoff -----	Unknown
(3)	Maximum tailwater -----	Unknown
(4)	Normal pool -----	1764
(5)	Full flood control pool -----	N/A

1.3 Pertinent Data

a. Drainage Area

The drainage area of 2.2 s.m. (1413 acres) is a rolling, wooded, undeveloped area that is part of October Mountain State Forest, Becket, Massachusetts. There are no major streams located within the area. There is one swamp and one unnamed small brook. Ground elevations within the drainage area vary between elevation 1764 (spillway level) to a maximum of elevation 2220.

b. Discharge at Outlet

1. Outlet Works

The outlet works for the dam consist of a spillway structure and channel and a 24 inch drain that outlets into the spillway channel, 4 feet downstream from the toe of the spillway weir. The invert elevation of the 24 inch line intake is unknown (assumed at elevation 1756₊). Its inlet is at the right upstream spillway training wall approximately 25 feet from the centerline of dam. Outflow through this line is controlled by a manually operated sluice gate. See Photograph 5 and 6. The invert of the pipe outlet is approximately elevation 1755₊. According to the caretaker, the gate was operable when last used several years ago. Its maximum capacity is about 55 cfs with the water level at elevation 1771.5, top of dam.

The spillway (photograph 15) consists of a 35 foot long concrete weir, upstream and downstream concrete training walls, a concrete deck service bridge, an energy dissipator and a mortared stone apron. The weir contains a central 5 foot long, 1'-6" deep drop section (photograph 15). It contains no

levels) at the homes. The maximum failure discharge would be 20,820 cfs. Prior to the dam failure, base flow could damage several homes and roads with flooding at least 1 foot deep. Additional damage could occur beyond the area studied.

e. Ownership

The dam is owned by the Commonwealth of Massachusetts, Department of Environmental Management. The address is 100 Cambridge Street, Boston, Massachusetts.

f. Operator

The dam is maintained and operated by the Department of Environmental Management, Division of Forests and Parks. Mr. Douglas Poland is the Regional Forest and Parks Supervisor. The address is 740 South Street, P.O. Box 1433, Pittsfield, Massachusetts, 01201. Telephone (413) 442-8928.

g. Purpose of Dam

The purpose of this dam is recreation.

h. Design and Construction History

An earlier dam, located at the present site, was believed to have been in operation in the middle 1800's. The present dam was built during 1965 to 1967. No additional information regarding the design, construction, or modifications to the dam was located.

i. Normal Operational Procedures

The main drain is normally left closed. The operating wheel is not kept at the dam but at the operator's office. The spillway has no provisions for stoplogs or flashboards. The level of the reservoir is normally not regulated.

approximately 30 feet upstream and approximately 47 feet downstream, as shown by photograph 5 in Appendix C and plan B-3 in Appendix B. The bridge over the spillway is approximately 28 feet wide and has concrete curbing and a metal railing (photograph 1). The bridge has a 26 foot long concrete approach slab on each end. The bridge is used for vehicular travel along the crest.

The upper crest of the spillway weir is approximately 4.5 feet below the bottom of the bridge deck. There is a 7'-3" wide by 1 foot deep energy dissipator located at the toe of the spillway weir.

The main drain is located on the upstream right training wall at the spillway (photograph 5). It consists of a manually operated sluice gate which controls discharge into the spillway channel approximately 4 feet downstream of the toe of the spillway weir. The outlet pipe has a 24 inch diameter.

c. Size Classification

The dam has an intermediate size classification based on its storage capacity of 2490 acre-feet. According to Corps guidelines, a project with a storage capacity of 1000 to 50,000 acre-feet is in the intermediate size classification.

d. Hazard Classification

The hazard potential is classified as high due to the potential for loss of more than a few lives from an assumed dam failure flood. It is estimated that within the area studied, approximately 6 homes would be impacted if the dam were to fail. Flood stage could reach depths of 2 to 12 feet (above first floor

1.2 Description of Project

a. Location

Buckley-Dunton Dam is located in the Town of Becket, in Berkshire County, Massachusetts. The dam is shown on the East Lee, Massachusetts U.S.G.S. Quadrangle, having the approximate coordinates of North $42^{\circ} 18' 45''$, West $73^{\circ} 07' 57''$. The outlet brook, Yokum Pond Brook, flows about 4 miles southeast to enter Depot Brook which flows another 4 miles to the Westfield River, near the Town of Chester.

b. Description of Dam and Appurtenances

Buckley-Dunton Dam is a 22 foot high, 370 foot long earth embankment dam with a concrete spillway and main drain. A concrete deck bridge spans the spillway outlet channel.

The earth embankment has a 28+ foot wide crest at elevation 1771.5. The dam crest is paved with asphalt between the right abutment and the concrete spillway bridge and is unpaved between the bridge and the left abutment. The upstream embankment face is riprap lined and inclined at an approximate 2H:1V slope. The downstream face is turf lined and inclined at an approximate 2H:1V slope. A County Inspection Report dated September 21, 1967 indicates that the embankment contains a concrete cutoff wall extending 100 feet north of the spillway and 70 feet south of the spillway.

The concrete spillway is located in the center of the dam. It contains a 35 foot long concrete weir, concrete training walls, a concrete deck bridge, an energy dissipator and a mortared stone apron. The weir is ungated and contains a central 5 foot long, 1'6" drop section (see photograph 15). The training walls are of variable height, roughly conforming to the slopes of the embankment and extend

PHASE I
NATIONAL DAM INSPECTION PROGRAM

SECTION 1
PROJECT INFORMATION

1.1 General

a. Authority

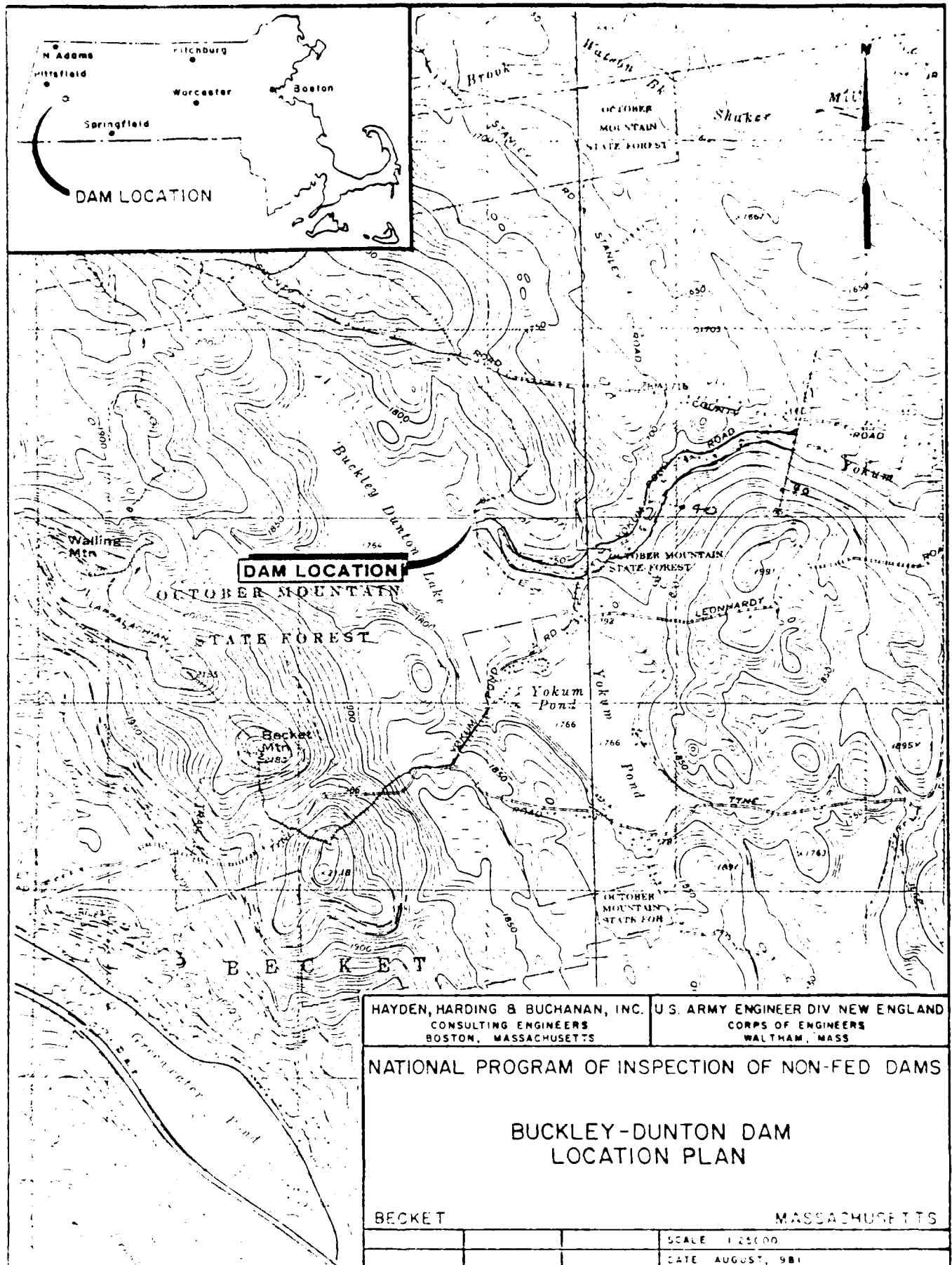
Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Hayden, Harding & Buchanan, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Massachusetts. Authorization and notice to proceed was issued to Hayden, Harding & Buchanan, Inc. on 26 June 1981 by William E. Hodgson Jr., Colonel, Corps of Engineers. Contract No. DACW 33-80-C-0006 has been assigned by the Corps of Engineers for this work.

b. Purpose

(1) Perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.

(2) Encourage and assist the States to initiate quickly, effective dam safety programs for non-Federal dams.

(3) To update, verify and complete the National Inventory of Dams.



areas and eventually lead to instability of the dam. Similarly, the spongy area left of the spillway could be the result of seepage through the dam.

b. The springs in the bottom of the spillway apron could be a result of seepage under the dam. It is also possible that these springs result from flow of water ponded in the energy dissipator at the downstream side of the spillway weir seeping under the apron and exiting at cracks in the apron floor.

c. The settlement of soil from under the bridge approach slab could eventually lead to structural deterioration of the slab as the soil support is lost.

d. Brush on slopes should be removed as part of regular maintenance.

SECTION 4

OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 Operational Procedures

a. General

The main drain structure normally remains closed. The spillway has no provisions for stoplogs or flashboards. The level of the reservoir is not regulated.

b. Description of Warning Systems

There are no warning systems at this dam.

4.2 Maintenance Procedures

a. General

General maintenance consists of mowing the side slopes and crest of the dam. Maintenance is performed by the October Mountain Forest Maintenance crews.

b. Operating Facilities

There is no formal operational procedure for this facility. The main drain normally remains closed. The operating wheel is not kept at the dam, but at the operator's office.

4.3 Evaluation

There are no formal written operational or maintenance procedures. Brush on the upstream and downstream slopes should be removed. The sluice gate should be operated yearly to insure continued

adequacy. The owner should institute a program of annual technical inspection and implement a formal maintenance and operation plan including a formal downstream emergency warning plan.

SECTION 5

EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 General

Buckley-Dunton Lake is located in the northwest section of the Town of Becket. The lake is part of October Mountain State Forest. The drainage area, 2.2 s.m. (1413 acres) is wooded, undeveloped land. There is only one small brook which carries water into the lake.

The outlet channel is Yokum Brook. It flows northeast into the town center at Becket (3.75+ miles), where it flows into the West Branch of the Westfield River.

5.2 Design Data

The dam was constructed in the mid 1960's, but no design data was located.

5.3 Experience Data

No records of rainfall or other experience data were located since 1967, when the dam was completed. However, the United States Weather Bureau records indicate that during the periods of August 11 to 15 and again from August 17 to 22, 1955 about 4 to 6 inches of rain fell in the general area of the lake.

5.4 Test Flood Analysis

The dam has a size classification of intermediate and a high hazard potential. Based upon Corps Guidelines, the test flood would be the full PMF. The test flood inflow from the 2.2 s.m. drainage

area, is 4,510 cfs. Inflow is based upon Corps Guidance curves for rolling terrain and runoff of 2050 cfs per s.m. The routed outflow through the spillway would be 2,065 cfs. The test flood outflow equals 100 percent of the spillway capacity. The dam is not overtopped.

Assuming the lake was initially filled to the level of the lower spillway weir, elevation 1764, the test flood inflow would surcharge the lake to elevation 1771.5, top of dam. The spillway's entire capacity is used to pass the test flood outflow. The alignment of the bridge deck does not appear to interfere with or reduce the spillway discharge capacity by restricting the flow depth at the spillway.

5.5 Dam Failure Analysis

The dam was determined to have a high hazard potential due to the potential for the loss of more than a few lives from an assumed dam failure flood. The dam was assumed to have failed when the water level was at elevation 1771.5, top of dam. The peak failure discharge is estimated to be 20,820+ cfs. This was developed by assuming a breach width of 120 feet for the 22 foot high structure.

The outlet channel, Yokum Brook, flows 3.75 miles northeast to reach the West Branch of the Westfield River, at the town center of Becket. A 7,000 foot long length of the outlet channel was studied to determine the hazard potential. The entire area along Yokum Pond Road is impacted. The road "parallels" the brook and is at the "same" elevation as the brook. Most homes were constructed near the brook, within several feet of the brook bank elevation.

At least six homes will be damaged by floodwater 2 to 12 feet deep (above first floor levels). Yokum Pond Road is completely flooded by water up to 22 feet deep in areas.

Beyond the area studied, station 70+00 to 200+00, there could be additional floodwater damage. The remaining 17,380 cfs will continue flowing along Yokum Pond Road, Route 8, and into the town center of Becket before reaching the West Branch of the Westfield River.

Just prior to dam failure, spillway discharge will be about 2065 cfs. This flow will cause downstream flood problems at roads, crossings and homes built near the brook channel. Flood water at least one foot deep could damage several homes within the area studied. Flooding damage beyond the study area could also occur.

SECTION 6

EVALUATION OF STRUCTURAL STABILITY

6.1 Visual Observations

The visual inspection disclosed seepage areas near the downstream toe of the dam and in the spillway apron which, if left unattended, could lead to instability of the dam in the future.

6.2 Design and Construction Data

No design or construction data was made available. However, an inspection report dated September 21, 1967 by the County of Berkshire, Massachusetts indicates that the embankment contains a concrete cutoff wall extending 100 feet north of the spillway and 70 feet south of the spillway.

6.3 Post Construction Changes

No significant post construction changes to the dam are known.

6.4 Seismic Stability

The dam is located within Seismic Zone 2 and in accordance with the recommended Phase I guidelines does not warrant seismic stability analysis.

SECTION 7

ASSESSMENT, RECOMMENDATIONS, REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition

The visual inspection indicated the dam to be in generally fair condition.

b. Adequacy of Information

The information available was very limited, and this assessment of the condition of the dam is based principally on the visual inspection.

c. Urgency

The recommendations and remedial measures presented in Sections 7.2 and 7.3 should be implemented within one year after receipt of this Phase I Inspection Report by the Owner.

7.2 Recommendations

The Owner should engage a qualified registered professional engineer to investigate and design required remedial measures for:

- a. The source of seepage found at locations near the downstream toe and at the downstream ends of the training walls.
- b. The source of springs flowing out of the spillway apron.
- c. The cause of settlement of soil from under the bridge approach slab.

The Owner should implement the recommendations of the engineer.

7.3 Remedial Measures

a. Operating and Maintenance Procedures

1. Brush growth on the upstream and downstream slopes and for a distance of about 20 feet downstream, should be cut as part of routine annual maintenance.
2. The trees and brush constricting the discharge channel for a distance of about 25 feet downstream, should be cut as part of routine maintenance.
3. The debris in the spillway apron and energy dissipator should be removed.
4. The minor erosion on the left side of the concrete road surface should be repaired.
5. The concrete erosion at the concrete-stone interface of the left training wall should be repaired.
6. The sluice gate should be operated yearly and repaired if necessary to insure continued adequacy.
7. All animal borrows should be backfilled.
8. The Owner should locate and make readily available, the design and construction data for the dam.
9. The Owner should institute a program of annual technical inspection. This inspection should include observation and documentation of seepage so that significant changes in flow can be detected. This inspection should be performed at both high and low reservoir level.

10. The Owner should develop a formal warning system for downstream areas in case of an emergency. The dam should be monitored during and immediately after periods of intense rainfall and records maintained.

7.4 Alternatives

There are no practical alternatives for these recommendations and remedial measures.

APPENDIX A
INSPECTION CHECKLIST

VISUAL INSPECTION CHECKLIST
PARTY ORGANIZATION

PROJECT BUCKLEY-DUNTON DAM

DATE 6/30/81

TIME 10:30

WEATHER Sunny, 30°

W.S. ELEV. 1765.5 U.S. DN.S.

PARTY:

1. Ron Cheney - HHB 6. _____

2. Dave Vine - HHB 7. _____

3. Mike Angieri - HHB 8. _____

4. Karl Dalenberg - GEI 9. _____

5. Cal Curtin - Dept. of Environ. Mgt. 10. _____

PROJECT FEATURE		INSPECTED BY	REMARKS
1.	Dam Embankment	R.C., D.V., M.A., K.D.	
2.	Intake Structure	R.C., D.V., M.A., K.D.	
3.	Spillway	R.C., D.V., M.A., K.D.	
4.			
5.			
6.			
7.			
8.			
9.			
10.			

PERIODIC INSPECTION CHECKLIST

PROJECT Buckley-Dunton Dam DATE 6/30/81
 PROJECT FEATURE Dam Embankment NAME K. Dalenberg, D. Vine
 DISCIPLINE Geotechnical, Structural, Hydraulic NAME R. Cheney, M. Angieri

AREA EVALUATED	CONDITION
<u>DAM EMBANKMENT</u>	
Crest Elevation	1771.5
Current Pool Elevation	1765.5
Maximum Impoundment to Date	Unknown
Surface Cracks	None.
Pavement Condition	Good.
Movement or Settlement of Crest	Erosion at left end of concrete bridge deck on crest.
Lateral Movement	None observed.
Vertical Alignment	Good.
Horizontal Alignment	Good.
Condition at Abutment and at Concrete Structures	Soil settlement below bridge approach slabs immediately left and right of spillway wingwalls 10-15 ft from each wall by 6 ft below concrete deck on upstream side.
Indications of Movement of Structural Items on Slopes	None observed.
Trespassing on Slopes	Boat ramp on right upstream abutment.
Sloughing or Erosion of Slopes or Abutments	None observed.
Rock Slope Protection - Riprap Failures	Good condition - no failures observed.
Unusual Movement or Cracking at or Near Toe	None observed.
Unusual Embankment or Downstream Seepage	1) Seepage at ends of spillway training wall 2) Spongy area at downstream toe 25-70 ft north of north spillway wingwall.
Piping or Boils	None observed.
Foundation Drainage Features	None.
Toe Drains	None.
Instrumentation System	None.
Vegetation	Small brush up to 4 ft tall on crest and downstream slopes.

PERIODIC INSPECTION CHECKLIST

PROJECT BUCKLEY-DUNTON DAM DATE 6/30/81
 PROJECT FEATURE Intake NAME K. Dalenbery, D. Vine
 DISCIPLINE Geotechnical, structural, hydraulic NAME R. Cheney, M. Angieri

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE</u>	
a. Approach Channel	
Slope Conditions	Below water.
Bottom Conditions	Below water.
Rock Slides or Falls	Below water.
Log Boom	None observed.
Debris	None observed.
Condition of Concrete Lining	Below water.
Drains or Weep Holes	Below water.
b. Intake Structure	
Condition of Concrete	Above water good.
Stop Logs and Slots	Below water.

Downstream Face of Dam: Condition: 1. Good____. 2. Minor Repairs X.
3. Major Repairs____. 4. Urgent Repairs____.

Comments:_____

Emergency Spillway: Condition: 1. Good____. 2. Minor Repairs____.
3. Major Repairs____. 4. Urgent Repairs____.

Comments:_____

Water level at time of inspection: 0.3 ft. above X below____.
top of dam____.
principal spillway X____.
other____.

Summary of Deficiencies Noted:

Growth [Trees and Brush] on Embankment X____.
Animal Burrows and Holes____.
Damage to slopes on top of dam____.
Cracks or Damaged Masonry____.
Evidence of Sliding____.
Evidence of Piping____.
Erosion____.
Leaks____.
Tree and/or debris impeding flow____.
Gaps or blocks spillway____.
Other____.

INSPECTION REPORT FOR DAMS AND EMBANKMENTS

1. Location: ~~XXXX/XXX~~ BUCKLEY

Dam No. 1-2-22-3

Name of Dam Buckley - Bunton

Inspected by: RJordan - RDeGen

Date of Inspection 10/27/75

2. Owner/s: Owner: Assessors

Prev. Inspection X

Reg. of Deeds Pers. Contact

1. Mass Dept Nat. Res. Engr. H. H. 15 Ashburton Pl Boston
 Name St. & No. City/Town State Tel. No.

2.
 Name St. & No. City/Town State Tel. No.

3.
 Name St. & No. City/Town State Tel. No.

3. Caretaker [if any] e.g. superintendent, plant manager, appointed by absentee owner, appointed by multi owners.

Name St. & No. City/Town State Tel. No.

4. No. of Pictures taken 4 (2 required)

5. Degree of Hazard: [if dam should fail completely]*

1. Minor X 2. Moderate

3. Severe 4. Disastrous

*This rating may change as land use changes [future development]

Outlet Control: Automatic Manual X

Operative X yes no

Comments:

Inspection made on Date Condition:

1. Good X 2. Minor Repair

3. Major Repair 4. Neglect/Failed

Comments:

- 3 -

12. Remarks & Recommendations; (Fully Explain)
PREVIOUS INSPECTION DATE: October 27, 1975

Except for light brush on the downstream slope, no deficiencies were noted.

The dam is in good condition and appears to be safe.

For location see Topo Sheet 5-C.

13. Overall Condition:

- X 1. Safe _____
X 2. Minor repairs needed _____
- - 3. Conditionally safe - major repairs needed _____
- - 4. Unsafe _____
- - 5. Reservoir impoundment no longer exists (explain)
Recommend removal from inspection list _____

B-6

DAM NO. 1-2-22-3

8. Downstream Face of Dam:

Condition: 1. Good _____ 2. Minor Repairs X _____
3. Major Repairs _____ 4. Urgent Repairs _____

9. Emergency Spillway

Condition: 1. Good _____ 2. Minor Repairs _____
3. Major Repairs _____ 4. Urgent Repairs _____

Comments: _____

10. Water level at time of inspection 0.2' above X below _____
top of dam _____
principal spillway X _____
other _____

11. Summary of Deficiencies Noted:

-X- Growth (Trees & Brush) on Embankment _____
- - Animal Burrows and Washouts _____
- - Damage to slopes or top of dam _____
- - Cracked or damaged masonry _____
- - Evidence of seepage _____
- - Evidence of piping _____
- - Erosion _____
- - Leaks _____
--- Trash and/or debris impeding flow _____
- - Clogged or blocked spillway _____
- - Other _____

INSPECTION REPORT - DAMS AND RESERVOIRS

1. Location: ~~City~~/Town BECKET Dam No. 1-2-22-3
 Name of Dam Buckley - Dunton Inspected by RDJordan-TilGrande
 Date of Inspection 10-5-77
 Previous Inspection 10-27-75

2. Owner/s per: Assessors _____
 Reg. of Deeds _____ Personal Contact _____

1. Mass. Dept. of Natural Resources 15 Ashburton Place Boston
 Name _____ St. & No. _____ City/Town/State _____ Tel. No. _____

2. _____
 Name _____ St. & No. _____ City/Town/State _____ Tel. No. _____

3. Caretaker (if any) e.g. superintendent, plant manager, appointed by absentee owner, appointed by multi owners.

_____ Name _____ St. & No. _____ City/Town/State _____ Tel. No. _____

4. No. of Pictures taken ONE

5. Degree of Hazard: (If dam should fail completely)*

1. Minor X 2. Moderate _____

3. Severe _____ 4. Disastrous _____

*This rating may change as land use changes (future development)

6. Outlet Control: Automatic _____ Manual X
 Operative _____ Yes X No _____

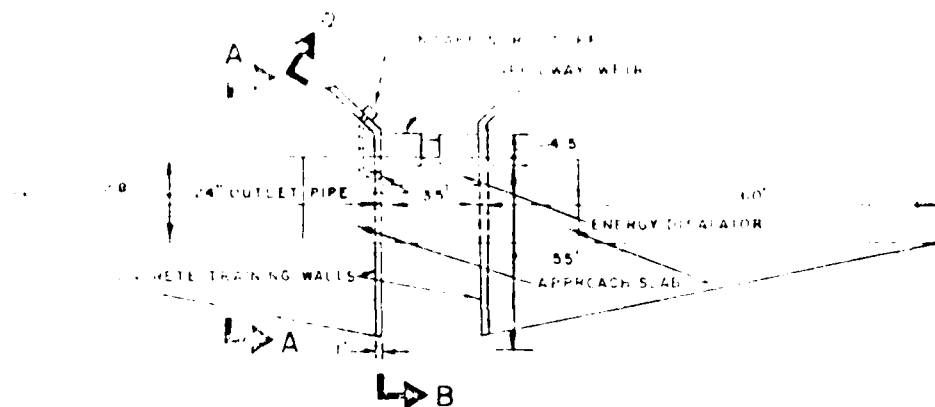
Comments: _____

7. Upstream Face of Dam:

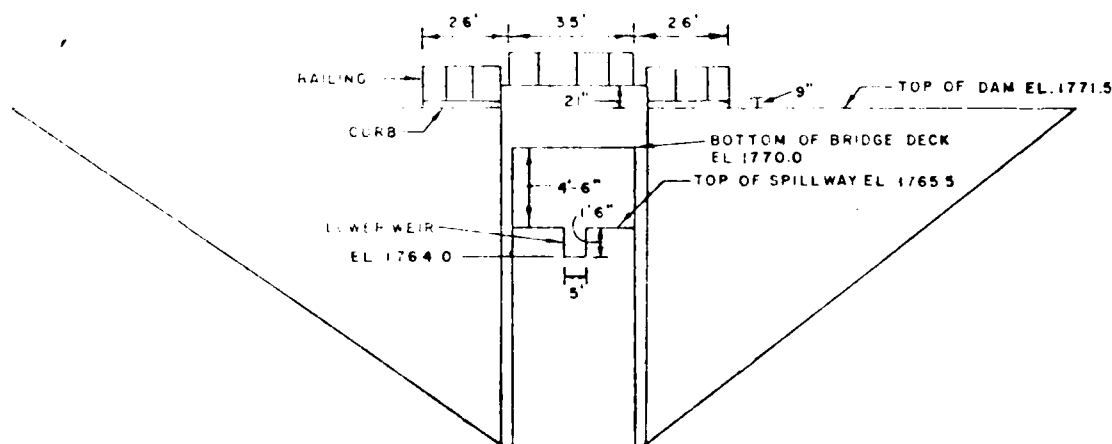
Condition: 1. Good X 2. Minor Repairs _____

3. Major Repairs _____ 4. Urgent Repairs _____

Comments: _____



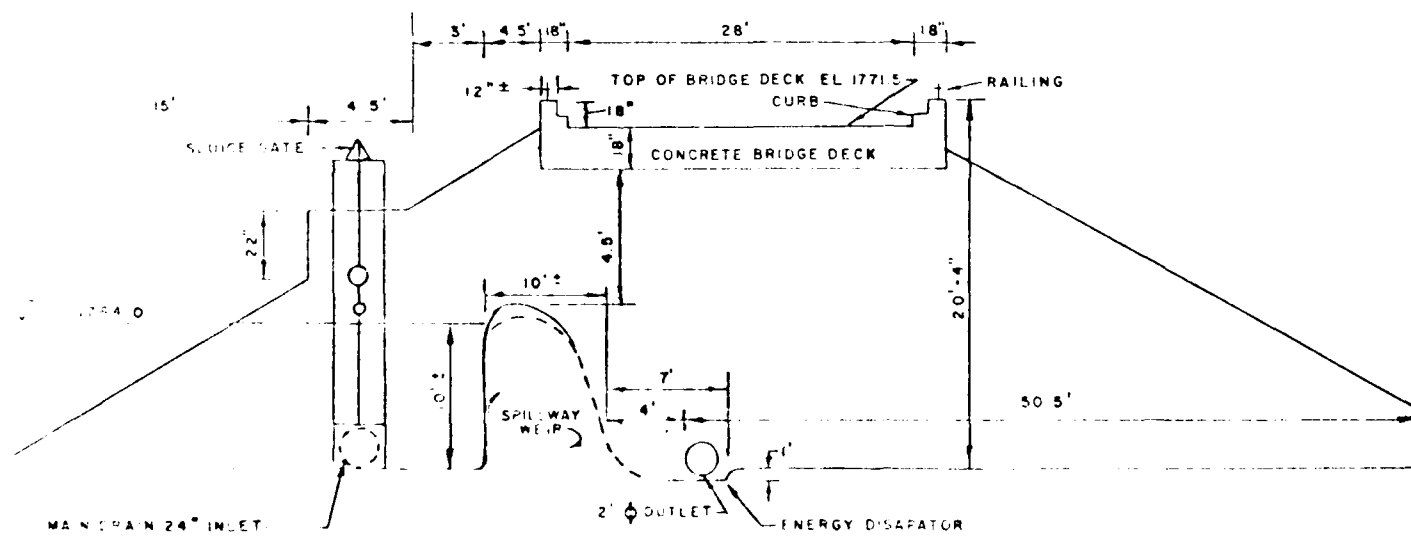
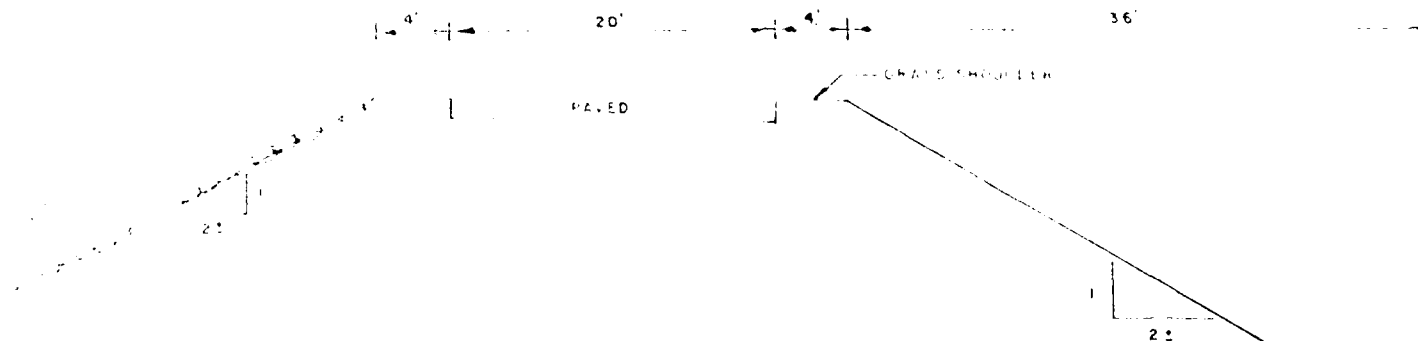
PLAN



PROFILE



HAYDEN, HARDING & BUCHANAN, INC. CONSULTING ENGINEERS BOSTON, MASSACHUSETTS		US ARMY ENGINEER DIV NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS	
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS			
BUCKLEY-DUNTON DAM PLAN, PROFILE & SECTIONS			
SHEET		MASSACHUSETTS	
		SCALE NOT TO SCALE	
		DATE AUG 27, 1961	



LIST OF ENGINEERING DATA

State Inspection Reports for the years 1977, 1975, 1973 and 1971 and a County Inspection Report from 1967 were made available at the State Department of Environmental Quality Engineering, Division of Waterways Office, 100 Nashua Street, Boston, Massachusetts 02114.

No additional engineering data was located.

APPENDIX B
ENGINEERING DATA

PERIODIC INSPECTION CHECKLIST

PROJECT BUCKLEY-DUNTON DAM DATE 6/30/81

PROJECT FEATURE Service Bridge NAME K. Dalenberg, D. Vine

DISCIPLINE Geotechnical, structural, hydraulic NAME R. Cheney, M. Angieri

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - SERVICE BRIDGE</u>	
a. Super Structure	Concrete deck bridge was in good condition.
Bearings	
Anchor Bolts	
Bridge Seat	
Longitudinal Members	
Underside of Deck	
Secondary Bracing	
Deck	
Drainage System	
Railings	
Expansion Joints	
Paint	
b. Abutment & Piers	
General Condition of Concrete	Good.
Alignment of Abutment	Good.
Approach to Bridge	Some erosion below approach slabs.
Condition of Seat & Backwall	Good.

PERIODIC INSPECTION CHECKLIST

PROJECT BUCKLEY-DUNTON DAM DATE 6/30/81

PROJECT FEATURE Spillway NAME K. Dalenberg, D. Vine

DISCIPLINE Geotechnical, structural, hydraulic NAME R. Cheney, M. Angieri

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS</u>	
a. Approach Channel	
General Condition	Below water.
Loose Rock Overhanging Channel	None.
Trees Overhanging Channel	None.
Floor of Approach Channel	Below water.
b. Weir and Training Walls	
General Condition of Concrete	Good.
Rust or Staining	None observed.
Spalling	Some at wall-floor interface.
Any Visible Reinforcing	None observed.
Any Seepage or Efflorescence	See comments below.
Drain Holes	Drainage occurring in some weepholes - some drains heavily rusted, but draining.
c. Discharge Channel	
General Condition	Overgrown downstream of dam.
Loose Rock Overhanging Channel	None observed.
Trees Overhanging Channel	Downstream of dam, some trees overhang channel
Floor of Channel	Observed five springs getting up from channel floor up to 2-in. above normal channel floor.
Other Obstructions	Minor debris in channel floor.
Other Comments	Seepage observed at downstream end of right training wall exiting about one foot above channel floor. Possible seepage from area downstream of left training wall.

PERIODIC INSPECTION CHECKLIST

PROJECT	<u>BUCKLEY-DUNTON DAM</u>	DATE	<u>6/30/81</u>
PROJECT FEATURE	<u>Outlet Works</u>	NAME	<u>K. Dalenberg, D. Vine</u>
DISCIPLINE	<u>Geotechnical, structural, hy-</u> <u>draulic</u>	NAME	<u>R. Cheney, M. Angieri</u>

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL</u>	
General Condition of Concrete	No outlet structure.
Rust or Staining	Outlet discharges into spillway channel.
Spalling	
Erosion or Cavitation	
Visible Reinforcing	
Any Seepage or Efflorescence	
Condition at Joints	
Drain holes	
Channel	
Loose Rock or Trees Overhanging Channel	
Condition of Discharge Channel	Outlet discharges into spillway channel

PERIODIC INSPECTION CHECKLIST

PROJECT BUCKLEY-DUNTON DAM DATE 6/30/81

PROJECT FEATURE Outlet Works NAME K. Dalenberg, D. Vine

DISCIPLINE Geotechnical, structural, NAME R. Cheney, M. Angieri
hydraulic

AREA EVALUATED	CONDITION
<p><u>OUTLET WORKS - TRANSITION AND CONDUIT</u></p> <p>General Condition of Concrete</p> <p>Rust or Staining on Concrete</p> <p>Spalling</p> <p>Erosion or Cavitation</p> <p>Cracking</p> <p>Alignment of Monoliths</p> <p>Alignment of Joints</p> <p>Numbering of Monoliths</p>	<p>None at this project.</p>

PERIODIC INSPECTION CHECKLIST			
PROJECT	BUCKLEY-DUNTON DAM	DATE	6/20/81
PROJECT FEATURE	Outlet Works	NAME	K. Dalenberg, D. Vine
DISCIPLINE	Geotechnical, structural, hydraulic	NAME	R. Cheney, M. Angieri

DATE 6/30/81

NAME K. Dalenberg, D. Vine

NAME R. Cheney, M. Angieri

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - CONTROL TOWER</u>	
a. Concrete and Structural	None at this project.
General Condition	
Condition of Joints	
Spalling	
Visible Reinforcing	
Rusting or Staining of Concrete	
Any Seepage or Efflorescence	
Joint Alignment	
Unusual Seepage or Leaks in Gate Chamber	
Cracks	
Rusting or Corrosion of Steel	
b. Mechanical and Electrical	Gates manually operated.
Air Vents	
Float Wells	
Crane Hoist	
Elevator	
Hydraulic System	
Service Gates	
Emergency Gates	
Lightning Protection System	
Emergency Power System	
Wiring and Lighting System	

10. Remarks & Recommendations: [Fully Explain] PREVIOUS INSPECTION DATE: 4/13/73

With the exception of light brush on the downstream slope, the dam appears to be well maintained and in good condition. The riprap on the upstream face is well bedded and shows no signs of sliding or settlement. There is no increase in the seepage reported in 1972.

For location see topo sheet 5-C.

12.

Overall Condition:

1. Safe X
2. Minor repairs needed _____
3. Conditionally safe - major repairs needed _____
4. Unsafe _____
5. Reservoir impoundment no longer exists [explain]
Recommend removal from inspection list _____

INSPECTION REPORT - DAMS AND RESERVOIRS

1. Location: City/Town Becket.Dam No. 1-2-22-3.Name of Dam Buckley - Dunton.Inspected by: RJordan - BTracy.Date of Inspection 4/13/73.

2. Owner/s: per: Assessors _____.

Priv. Inspection 4.

Reg. of Deeds _____ Pers. Contact _____.

1. Mass DNR -15 Ashburton Pl. Boston
Name _____ St. & No. _____ City/Town _____ State Tel. No. _____2. _____
Name _____ St. & No. _____ City/Town _____ State Tel. No. _____3. _____
Name _____ St. & No. _____ City/Town _____ State Tel. No. _____

4. Gambaker [if any] e.g. swimming pool, plant manager, appointed by absentee owner, appointed by multi owners.

Name _____ St. & No. _____ City/Town _____ State Tel. No. _____

5. No. of Pictures taken 4.

6. Degree of Hazard: [if dam should fail completely]*

1. Minor x 2. Moderate _____

3. Severe _____ 4. Disastrous _____

*This rating may change as land use changes [future development]

7. Outlet Control: Automatic _____ Manual x.Operative x yes: _____ no: _____

Comments: _____

8. Upstream Face of Dam: Condition:

1. Good x 2. Minor Repairs _____

3. Major Repairs _____ 4. Urgent Repairs _____

Comments: _____

8. Downstream Face of Dam: Condition: 1. Good____. 2. Minor Repairs x.
3. Major Repairs____. 4. Urgent Repairs____.

Comments: _____

9. Emergency Spillway: Condition: 1. Good____. 2. Minor Repairs____.
3. Major Repairs____. 4. Urgent Repairs____.

Comments: _____

10. Water level at time of inspection: 0.3 ft. above x below____.
top of dam____.
principal spillway x____.
other____.

11. Summary of Deficiencies Noted:

Growth [Trees and Brush] on Embankment____.
Animal Burrows and Washouts____.
Damage to slopes or top of dam____.
Cracked or Damaged Masonry____.
Evidence of Seepage x____.
Evidence of Piping____.
Erosion____.
Leaks____.
Trash and/or debris impeding flow____.
Clogged or blocked spillway____.
Other_____

12. Remarks & Recommendations: [Fully Explain]

Only two minor deficiencies were noted during this inspection. There is some seepage located approximately 50' northerly of the spillway and the construction joints in the spillway sidewalls should be resealed in the near future.

Except for these minor deficiencies the dam appears to be in good condition.

Proctor not done
(sent to DWA)
JTD 1-22-72

13.

Overall Condition:

1. Safe_____
 2. Minor repairs needed_____ X
 3. Conditionally safe - major repairs needed_____
 4. Unsafe_____
 5. Reservoir impoundment no longer exists [explain]_____
- Recommend removal from inspection list_____

DESCRIPTION OF DAM

DISTRICT ONESubmitted by ED JordanDam No. 1-2-22-3Date 4-13-73City/Town BecketName of Dam Buckley - Dunton

1. Location: Topo Sheet No. 5-C

Provide 8-1/2" x 11" in clear copy of topo map with location of Dam clearly indicated.

2. Year built: 1967 Year/s of subsequent repairs _____

3. Purpose of Dam: Water Supply _____, Recreational X
Irrigation _____, Other _____

4. Drainage Area: _____ 2.2 sq. mi. _____ acres.

5. Normal Ponding Area: _____ 195 Acres; Avg. Depth _____
Impoundment: _____ gals; _____ acre ft.

6. No. and type of dwellings located adjacent to pond or reservoir _____
i.e. summer homes etc. _____

7. Dimensions of Dam: Length 385' Max. Height 23.5'
Slopes: Upstream Face rock face 2:1
Downstream Face earth 2:1
Width across top 29'

8. Classification of Dam by Material:
Earth X , Conc. Masonry _____, Stone Masonry _____
Timber _____, Rockfill _____, Other _____

9. Description of present land usage downstream of dam: _____
100 rural, _____ urban.

- B. Is there a storage pond or flood plain in location of dam which could accommodate the impoundment in the event of a complete dam failure?
Yes _____ No X

10.

Risk to life and property in event of complete failure.

No. of people _____.

Failure could cause some damage to

No. of homes _____.

Yokum Pond Road.

No. of Businesses _____.

No. of Industries _____.

No. of Utilities _____.

Railroads _____.

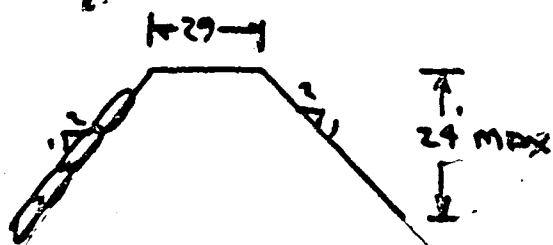
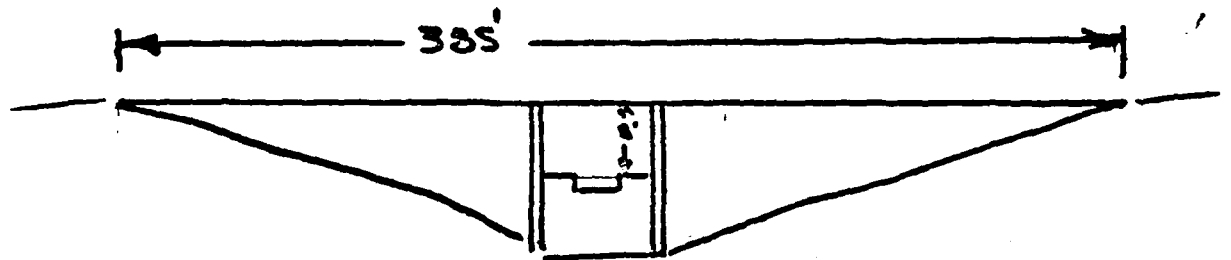
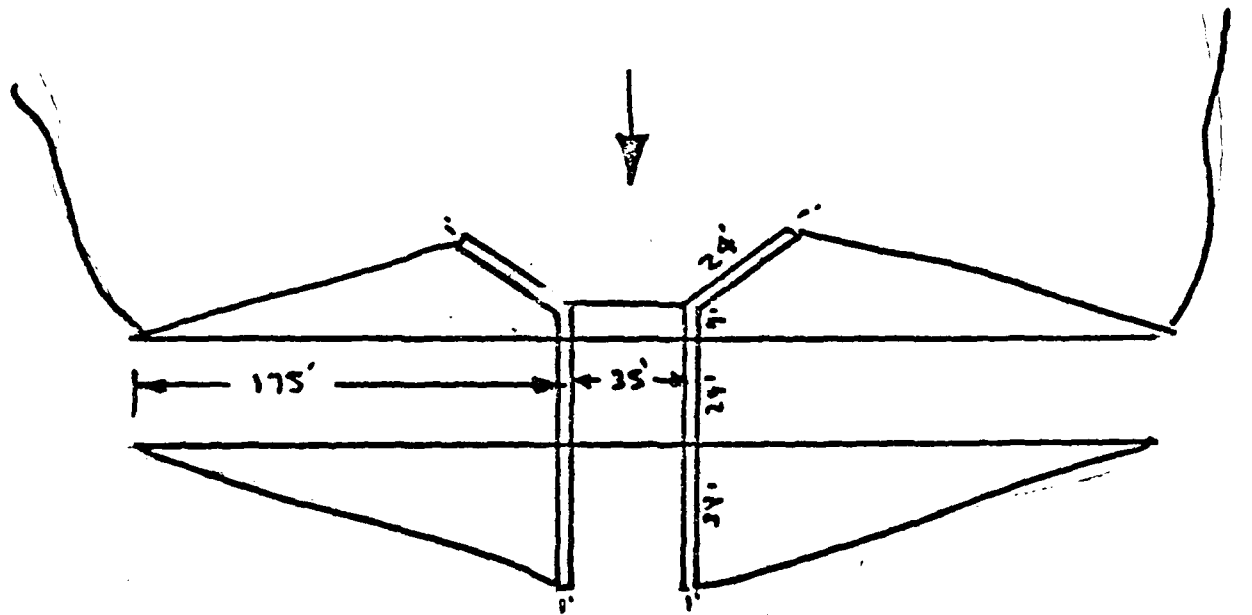
Other _____.

Cth _____.

11.

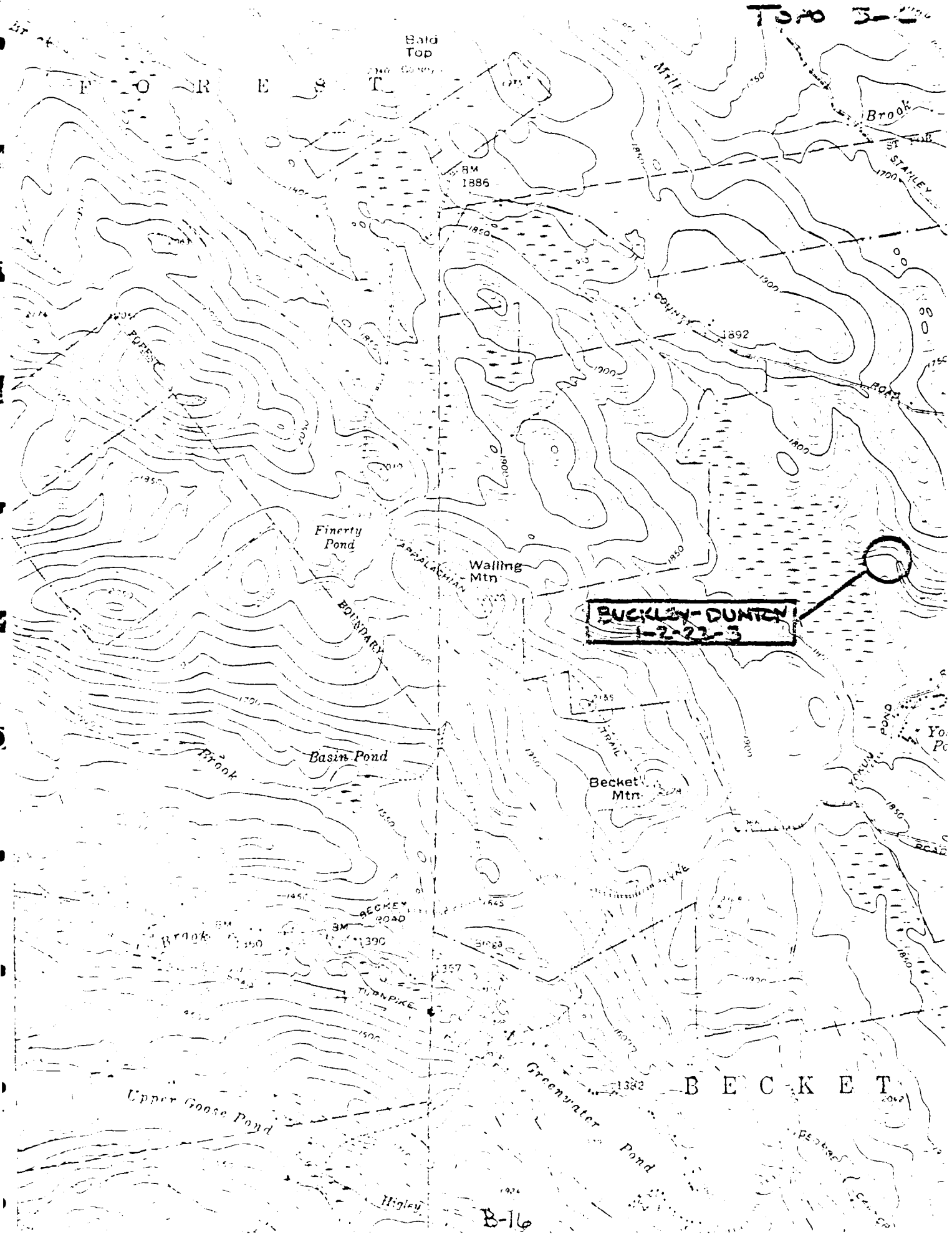
Attach Sketch of dam to this form showing section and plan on 8-1/2" x 11" sheet.

BUCKLEY-DUNTOP
1-2-22-3



B-15

Top 3-2



Bald Top

FOREST

BM 1886

Brook

ST. STALEY

1892

Finerty Pond

Walling Mtn

BUCKLEY-DUNTON
1-2-22-3

Basin Pond

Becket Mtn

BECKETT ROAD

BM 1390

TURNPIKE

Upper Goose Pond

Greenwater Pond

BECKETT

Higley

B-16

916

February 16, 1972

Arthur W. Brownell, Commissioner
Department of Natural Resources
100 Cambridge Street
Boston, Massachusetts

Re: Inspection of Dam
Becket
Duckley-Cunton Dam

Dear Commissioner Brownell:

The Massachusetts Department of Public Works inspected Duckley-Cunton Dam in the Town of Becket, of which the Department of Natural Resources is the owner.

The inspection was made in accordance with Chapter 253 of the Massachusetts General Laws, as amended by Chapter 595 of the Acts of 1970.

The results of the inspection indicated that no immediate maintenance or repairs were required; however, the following items were noted that will require your attention in the future:

1. Joints where spillway abutts. pilewalls need to be sealed.
2. Investigate and correct seepage at toe of embankment on both sides of spillway.

We are calling these items to your attention now before they become more serious and expensive to correct.

Very truly yours,

Frederick C. Hoffman
FRED. C. HOFFMAN P.E.
Deputy Chief Engineer

RA

RA:amm
c.c. Dean P. Amidon DME #1

INSPECTION OF DAMS

Dam #3-3

City or Town of Becket Date June 4, 1971
Name of Dam Buckley - Omten Inspector R. Northrup
P. Fezzie
Owner Dept of Natural Resources Address 15 Ashburton Pl. - Boston
Caretaker Gilbert Bliss Address Cascade St. - Pittsfield
Location 1/4 mile northwest of Yokum Pond Rd. - Leonhart Rd. intersection
Type of Dimensions earth - concrete cut off wall - 100' north of spillway
70' south spillway - 520' long - 23.5 high
Spillway, type and size 0.6 type concrete - 35' long - 3.5 freeboard
Outlets, type and size 24" bypass pipe and slide gate
Flashboards, type and height none
Date Built 1965-67 Condition good - except as noted
When last repaired By whose orders
Nature of Repairs

Purpose of Dam recreation
Approximate storage of water 195 acres
Approximate area of water shed 2.2 square miles
Possible damage due to failure of dam roads and property below

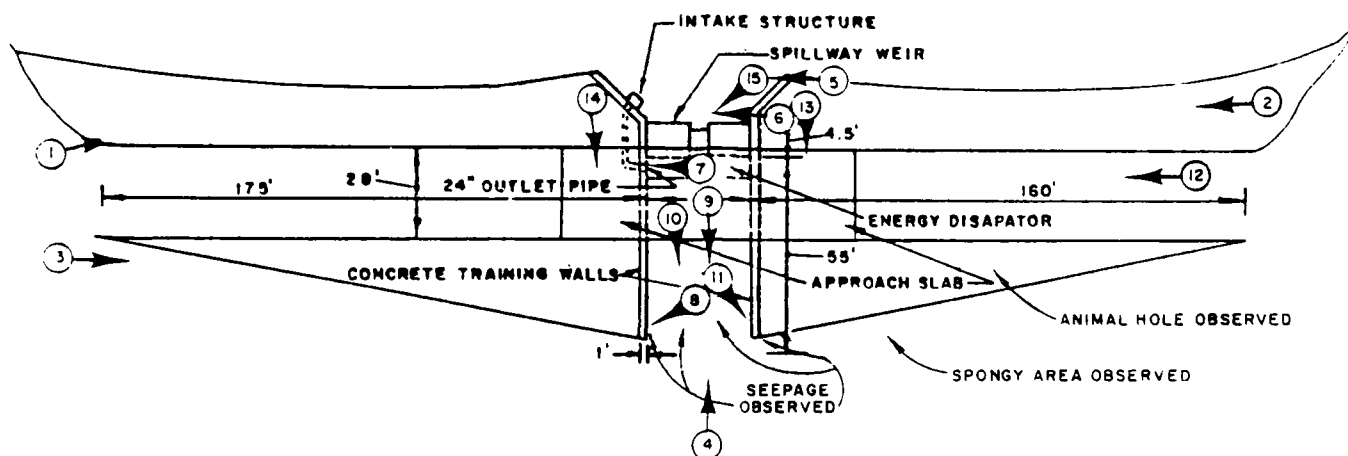
Remarks water 2" over spillway - gate partially open - seepage at toe of
embankment on both sides of spillway

Recommendations joints where spillway abuts sidewalls need to be sealed -
investigate seepage and make necessary repairs to correct

COUNTY OF BERKSHIRE, MASS.
INSPECTION OF DAMS

City or Town of Becket Date 21, Sept. 1967
Name of Dam Buckley-Dunton Inspector Louis J. Diamond
Owner Dept. Natural Resources Address Ashburton Pl., Boston, Mass.
Caretaker Gilbert Bliss Address Pittsfield, State Forest Tel. 442-8892
Location N.W. of Yekum Pd. Rd. -1/4 mi.
Type and Dimensions Earth- Conc. cutoff wall 100' north of splwy.--
70' south splwy. 529' lg. - 23.5' high
Spillway, type and size O.G. type conc. 35' lg. - 5' drop section-
3.5' freeboard.
Outlets, type and size 24" bypass pipe and slide gate.
Flashboards, type and height None
Date Built 1965-67 Condition Excellent
When last repaired _____ By whose orders _____
Nature of Repairs _____
Purpose of Dam Recreational development by D.N.R.
Approximate storage of water 195 sq. acres
Approximate area of water shed 2.2 sq. mi.
Possible damage due to failure of dam To roads and property below.
Remarks Water at but not over drop section- Upstream slope O.K.
Road from Yekum to dam completed- Gate closed.
Recommendations South side of spillway downstream ready for
cleaning and clearing.

APPENDIX C
PHOTOGRAPHS



HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON, MASSACHUSETTS

U.S. ARMY ENGINEER DIV. NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

BUCKLEY-DUNTON DAM PHOTO LOCATIONS

BECKET

MASSACHUSETTS

SCALE NOT TO SCALE

DATE AUGUST, 1981



PHOTO NO. 1 - View of crest of dam, upstream face and reservoir taken from
right abutment.

JOB NO. 7-206.1001
 DATE 7-20-51
 BY MJA
 RECD BY

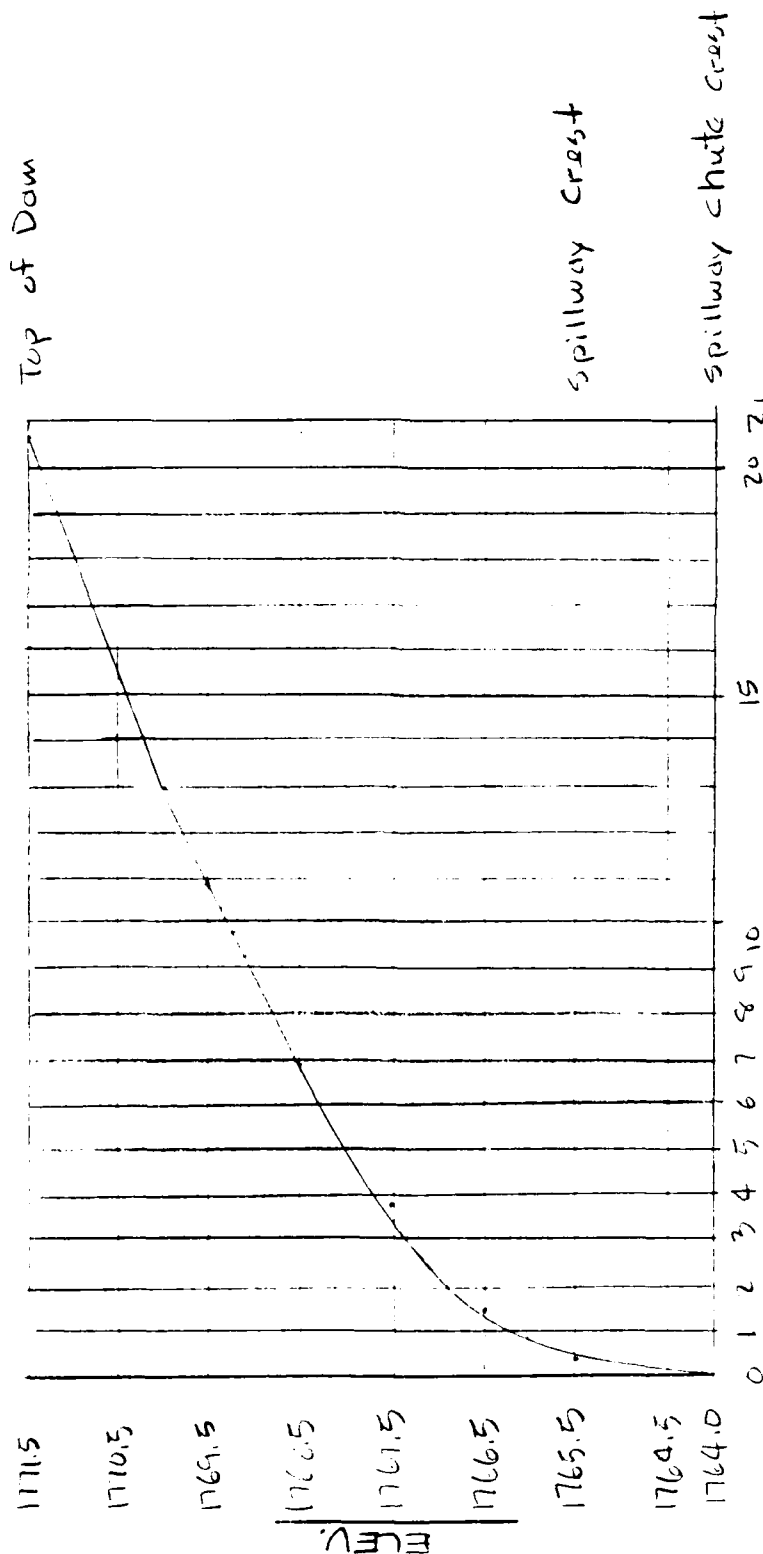


HAYDEN, HARDING & BUCHANAN, INC.
 CONSULTING ENGINEERS
 BOSTON — WEST HARTFORD

SHEET NO 26

JOB
 SUBJECT
 CLIENT

Spillway Discharge



A) Discharge x 100 cfs

B NO 79.206.1091
 TE 7-10-81
MD
 D BY 50.00



HAYDEN, HARDING & BUCHANAN, INC
 CONSULTING ENGINEERS
 BOSTON — WEST HARTFORD

SHEET NO D 5
 JOB Dam
 SUBJECT Spillway Design
 CLIENT COE

Spillway Capacity

$$Q = CLH^{3/2}$$

D	C	L	H ^{3/2}	Q _s	ELEV	D	ELEV	Q _T = Q _s + Q _{chute}
0.5	3.11	35'	0.35	38.	1766.	0	1764	0 Chute
1.0	3.24	"	1.0	113.	1766.5	.5	1764.5	5.5 "
1.5	3.36	"	1.84	216.	1767	1	1765.0	16.25 "
2	3.45	"	2.83	341.	1767.5	1.5	1765.5	31.4 "
3	3.6	"	5.2	654.	1768.5	(1/2)	1766.	69. Chute+Spill
4	3.75	"	8.	1050.	1769.5	1	1766.5	144. "
4.5	3.79	"	9.5	1265	1770	2	1767.5	372. "
0.08	3.	"	.024	2.5	1765.08	3	1768.5	685. "
						4	1769.5	1081. "
0.25	3.	"	.125	13.1 ±	1765.75	4.5	1770.	1296. "
6.0	3.95	"	14.7	2032	1771.0	6.0	1771.5	2061 "

see chart (A)

Storage Capacity see chart (C)

Elev	D	Area	Area Ave	Vol a-f	Dam Total Cumul Vol a-f	Above Spillway Crest
1757	0	30	—	—	—	—
1764	7	139	85	596	596.	0
1765.5	1.5	156	148	222	818.	222
1770	4.5	207	182	819	1637.	1041
1771.5	1.5	220	214	321	1958.	1362
1772.5	1	"	220	220	2178	1582
1773.5	1	"	"	220	2398	1802
1774.0	0.5	"	"	110	2508	1912

Dam Overflow Discharge

D	L	H ^{3/2}	C	Q	ELEV	Q _T
1	360	1	2.63	947	1772.5	3005
1.5	380	1.84	"	1840	1773.0	3888
2	410	2.82	"	3050	1773.5	5108
2.5	450	3.95	"	4678	1774.0	6736

see chart (B)

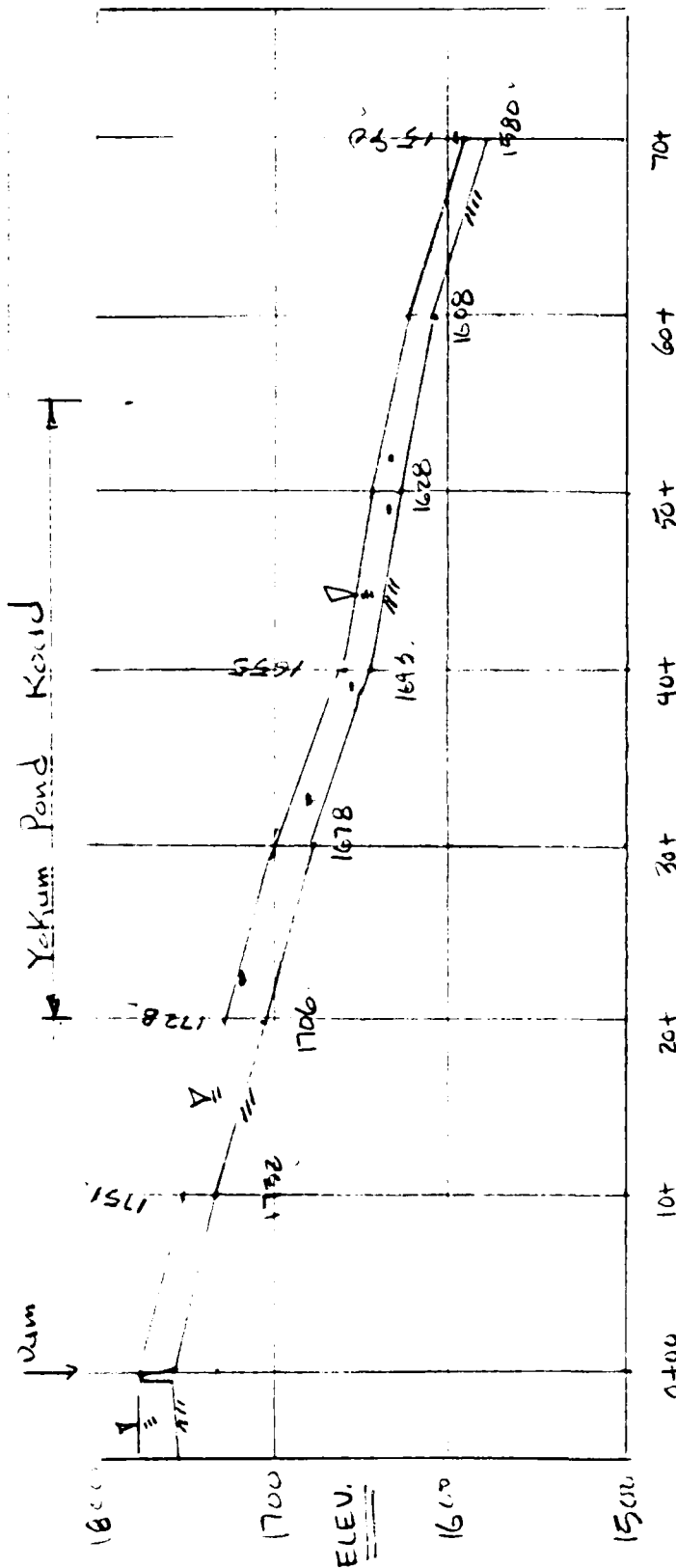
JOB NO 79206.1001
 DATE 7-20-81
 BY MJA
 CMO BY



HAYDEN, HARDING & BUCHANAN, INC.
 CONSULTING ENGINEERS
 BOSTON — WEST HARTFORD

SHEET NO D 4A

JOB Dams
 SUBJECT Is-D
 CLIENT CCE



Dam Failure Flood Profile

DR NO 79.70-100
DATE 7-20-84
BY HJH
HD BY



HAYDEN HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON — WEST HARTFORD

SHEET NO 24

JOB
SUBJECT Buckley Danton
CLIENT

TEST FLOOD ANALYSIS

Size Class: 22' hyd height (small)
2491.0 ft storage (Intermediate)

Use: Intermediate

Hazard Potential Class

Between Dam & Sta. 70+00 6 homes
Impacted by failure flooding

Test Flood: Full PMF

Drainage Area = 1413 a or 2.2 sq. mi.
rolling, wooded area \therefore Inflow = 2050 cfs/sq. mi.
no main streams, 1 swamp + small brook

$$\text{PMF} = 2.2 \times 2050 = 4,510. \text{ cfs Inflow}$$

$$Q_{P1} = 4,510. \text{ cfs} \quad D_1 = 1773.2 \quad S = 1730 \text{ or } 14.7''$$

$$Q_{P2} = 4,510. \left(1 - \frac{14.7}{19}\right) = 1023. \text{ cfs}$$

$$El_2 = 1769.3 \quad St_{H2} = 730 \text{ a-f or } 5.8''$$

$$St_{H \text{ ave}} = \frac{5.8 + 14.7}{2} = 10.3''$$

$$Q_{P3} = 4,510. \left(1 - \frac{10.3}{19}\right) = 2065. \pm \text{ cfs}$$

$$Elev = 1771.5 \pm$$

Dam is NOT OVER TOPPED

JOB NO. 79.206.1001
DATE 7-16-81
BY W/A
CHKD BY W/A



HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON — WEST HARTFORD

SHEET NO. D-3
JOB D-3
SUBJECT B-D
CLIENT CAF

DAM FAILURE ANALYSIS

Hydraulic Height = $22 \pm$ Ft.

LENGTH OF DAM AT MID HEIGHT = $300 \pm$ Ft.

$$Q_F = \frac{8}{27} (0.4 \times 300') \sqrt{32.2} (22^{3/2}) = 20820 \text{ cfs}$$

Base Flow prior to Failure about 2065 cfs
This will cause roadway Flooding at least
1 ft. deep and could "Flood" several
homes along Yokum Pond Road.

Within The area studied -

Dam Failure Outflow will Flood
Yokum Pond Rd from Sta 20+00 to
55+00

At least 6 homes will receive Flood
water damage of 2 to 12 feet along Yokum
Pond Rd.

Beyond area studied - Further damage
could occur along Yokum Pond Road,
Route 8, and the Town of Becket.
Homes could be flooded and
roads flooded. Sta 70+00 to 220+00
Outlet channel is "narrow, confined
and steep."

JOB NO 79.200.001
DATE 7-21-81
BY WJA
CHKD BY _____



HAYDEN, HARDING & BUCHANAN, INC
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BOSTON — WEST HARTFORD

SHEET NO D 2
JOB Dams
SUBJECT Becket Dam
CLIENT C&E

Becket Dam

Part of "October Mountain State Forest"
Town of Becket, Mass.

Built in middle 1960's at site of
older, washed-out dam which
had supplied water to mills
in Becket

Use - Recreational

Size class : Intermediate

Hazard Potential : High

Test Flood Inflow : 4,510.± cfs ✓

Routed Test Flood Outflow : 2,065.± cfs ✓

Dam is not overtopped.

APPENDIX D
HYDROLOGIC AND HYDRAULIC COMPUTATIONS

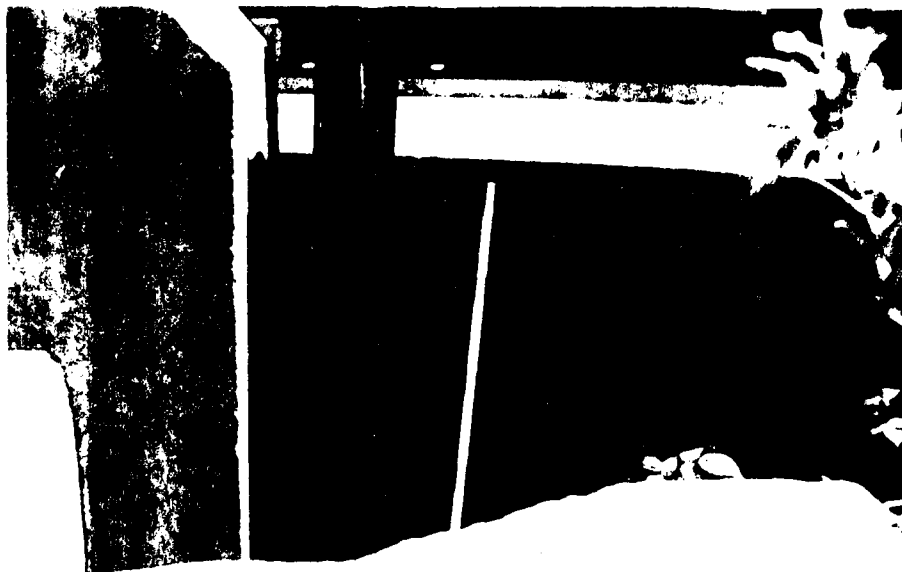


PHOTO NO. 14 - Erosion of soil below upstream side of concrete approach slab, right of spillway channel, extending 10 to 15 feet from spillway and up to 6 feet under deck.

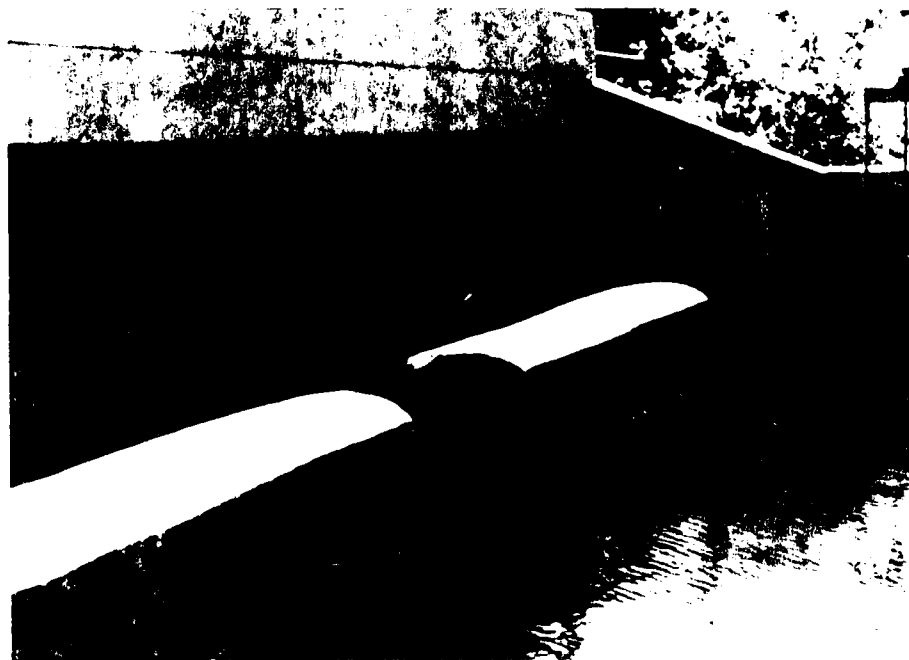


PHOTO NO. 15 - View of spillway weir.



PHOTO NO. 12 - Dam crest from left abutment, showing minor erosion of crest on left side of concrete bridge deck.



PHOTO NO. 13 - Erosion of soil below upstream side of concrete approach slab, left of spillway channel, extending 10 to 12 feet from spillway and up to 6 feet under deck.



PHOTO NO. 10 - Spillway discharge channel from spillway apron.



PHOTO NO. 11 - Possible seepage area at downstream end of left spillway training wall.



PHOTO NO. 8 - Downstream end of right spillway training wall showing area of seepage behind ruler, about 1 foot above channel floor.



PHOTO NO. 9 - Boil in spillway channel floor spraying clear water about 2 inches above channel flow.



PHOTO NO. 6 - View of manually controlled gate for main drain.



PHOTO NO. 7 - View of 24 inch diameter outlet pipe located 4 feet downstream of spillway weir.



PHOTO NO. 4 - Spillway apron from discharge channel.

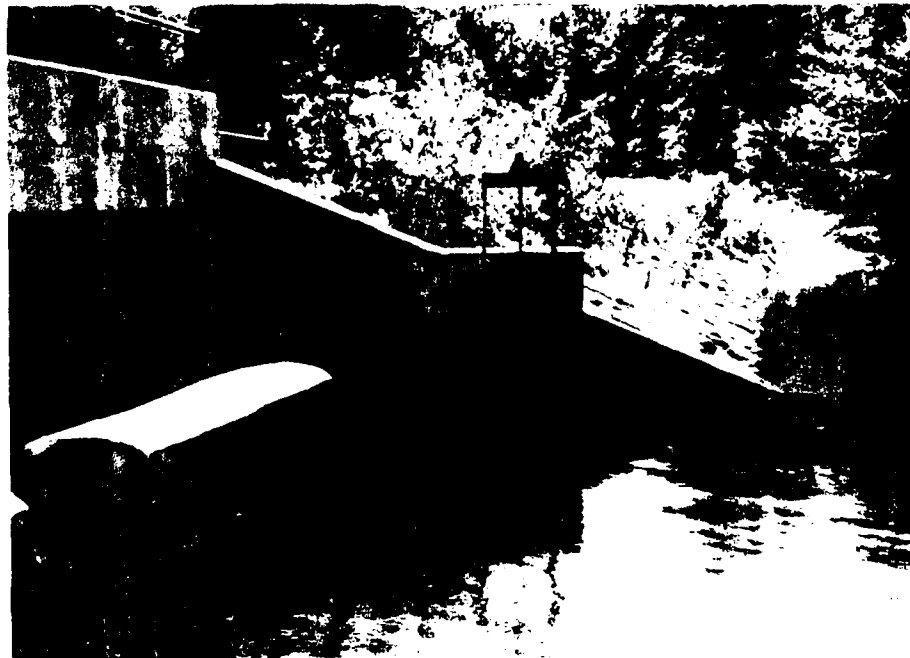


PHOTO NO. 5 - View of upstream face, sluice gate control and spillway weir. Note: 1'-6" drop section in spillway weir in lower left corner of Photo.



PHOTO NO. 2 - Upstream face from left abutment showing riprap and small brush.



PHOTO NO. 3 - Downstream face of dam from right abutment.

JOB NO. 79.206.1001
DATE 7-21-81
BY WJH
CHKD BY WJH

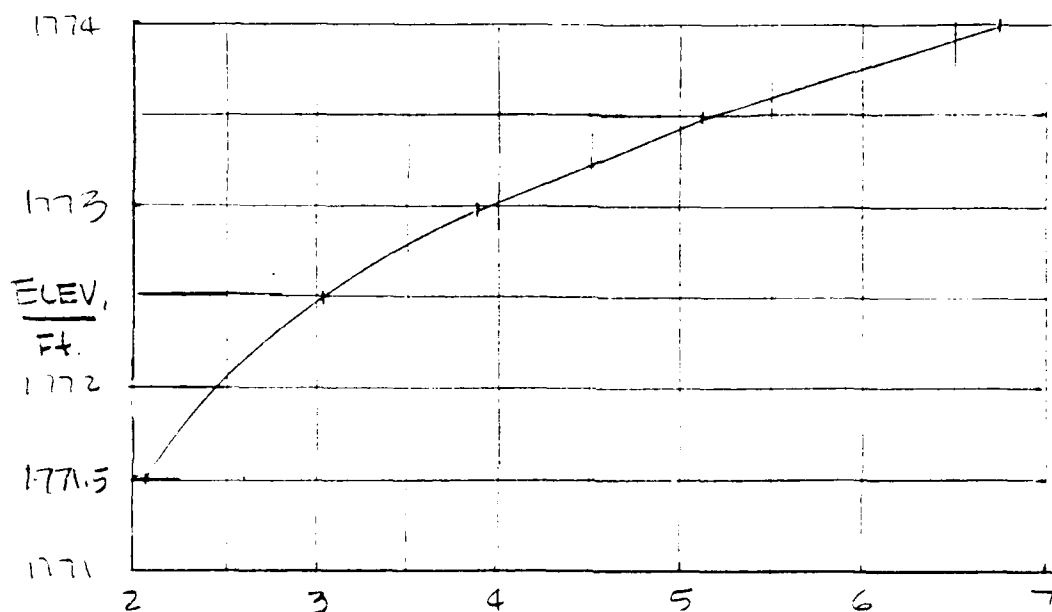


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SHEET NO. D7

JOB DAM
SUBJECT S-D
CLIENT CDE

Combined Discharge - Spillway / Dam Over-Flow



3) Discharge x 1000 cfs

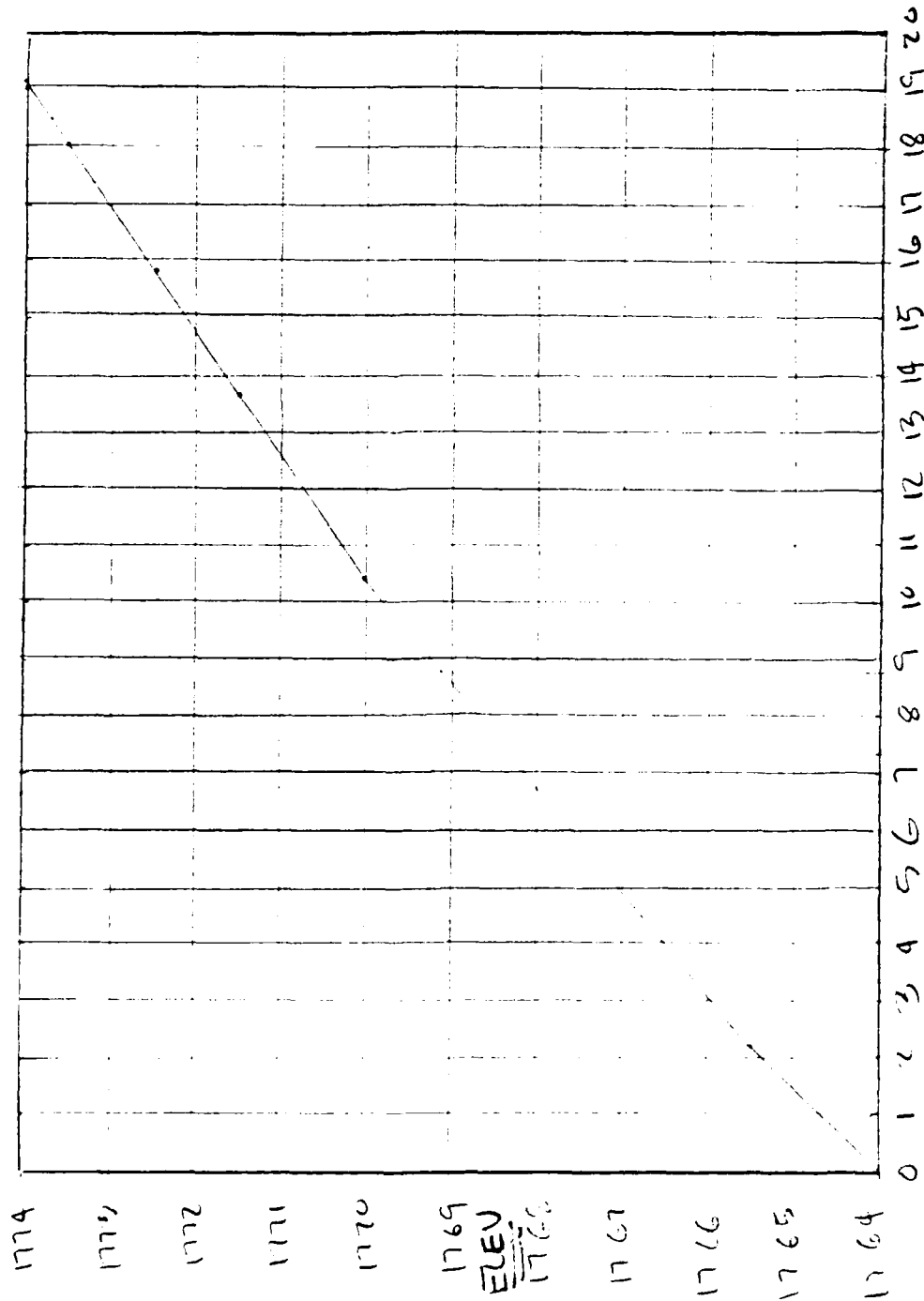
JOB NO. 79206.1001
 DATE 7-20-81
 BY J.H.
 CHD BY J.H.



HAYDEN, HARDING & BUCHANAN, INC
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 BOSTON — WEST HARTFORD

SHEET NO. D 8
 JOB D 304
 SUBJECT Final Exam - D 304
 CLIENT COE

Storage



c) Storage x 100 vs ELEV

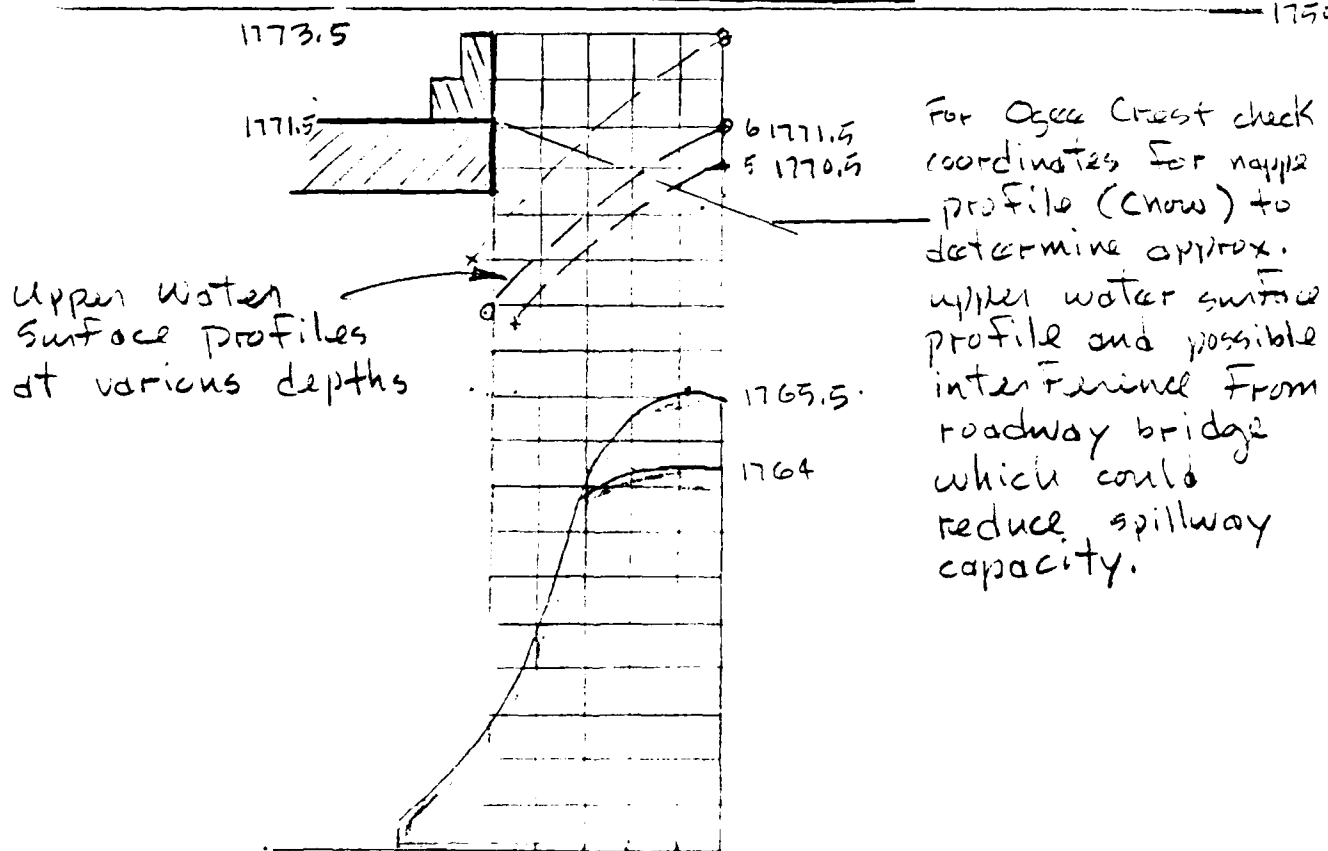
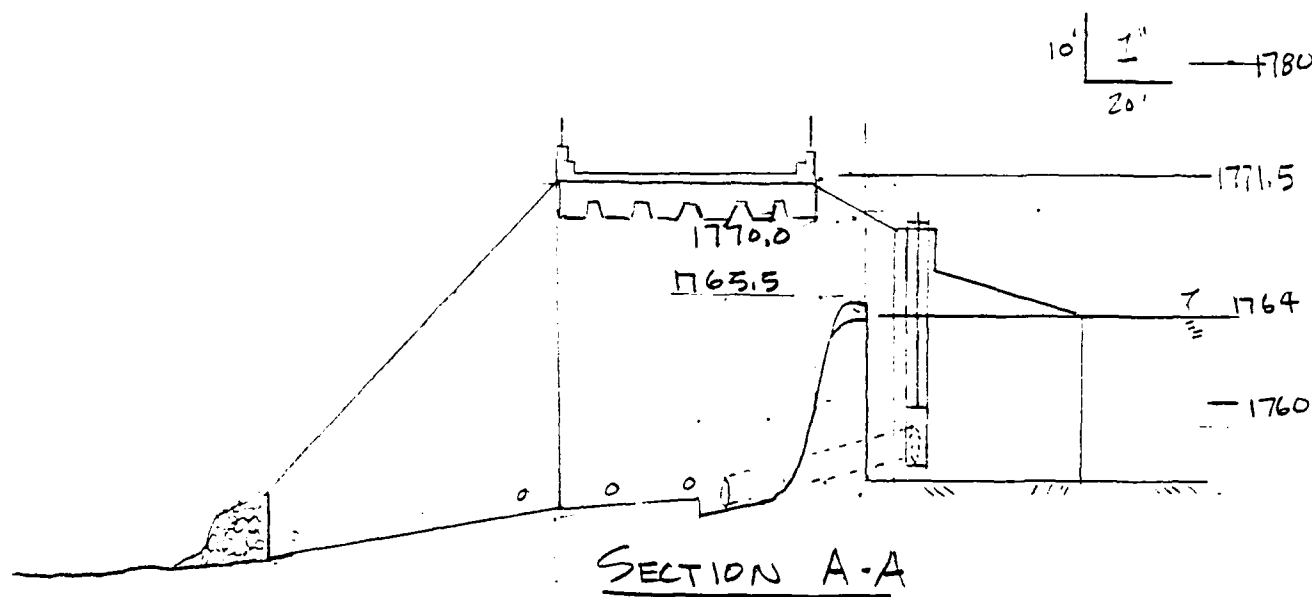
JOB NO. 206.1001
 DATE 7-15-51
 BY WJH
 CHD BY WJH



HAYDEN, HARDING & BUCHANAN, INC.
 CONSULTING ENGINEERS
 BOSTON — WEST HARTFORD

SHEET NO. D9

JOB Dams
 SUBJECT Duck Creek Dam
 CLIENT CE



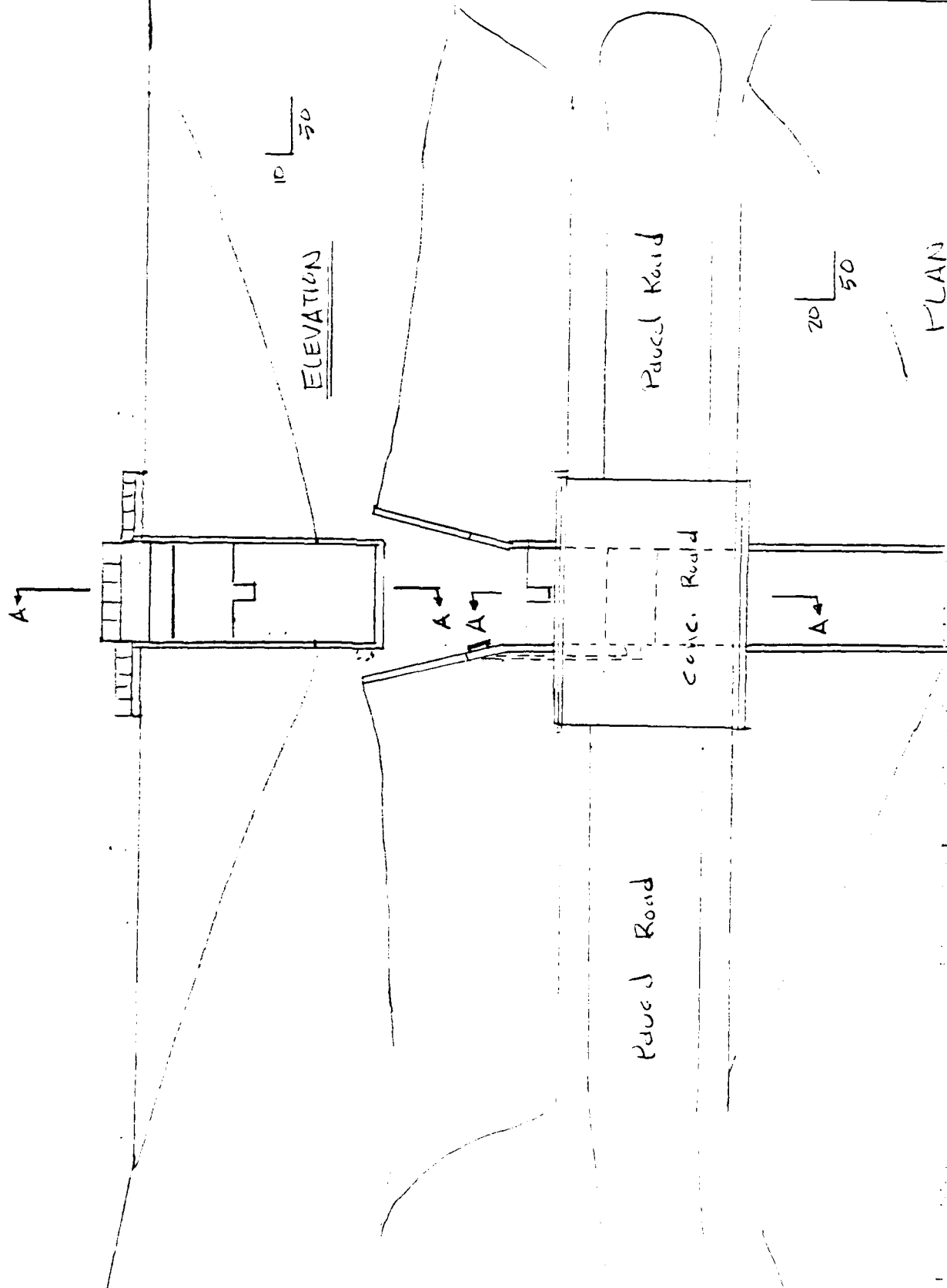
JOB NO 75-206.1001
DATE 7-5-81
BY MJS
CHD BY _____



HAYDEN, HARDING & BUCHANAN, INC
CONSULTING ENGINEERS
BOSTON — WEST HARTFORD

SHEET NO D10

JOB Valley
SUBJECT Quaker Division
CLIENT COE



JOB NO 79,206.1001
 DATE 7-16-81
 BY MJA
 CHD BY FEEDS



HAYDEN, HARDING & BUCHANAN, INC
 CONSULTING ENGINEERS
 BOSTON — WEST HARTFORD

SHEET NO D 11
 JOB Dams
 SUBJECT B-D
 CLIENT COE

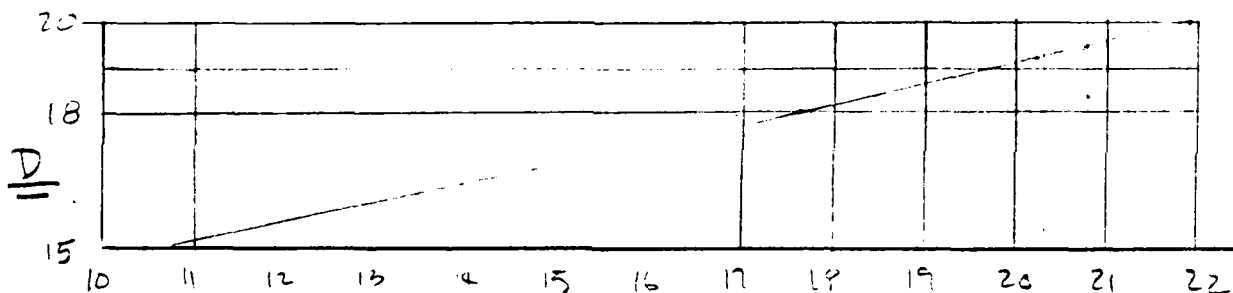
Sta 10+00

$Q_{P1} = 20820 \text{ cfs}$

$$V = \frac{1.486}{0.10} R^{2/3} (0.017)^{1/2} = R^{2/3} 1.94$$

D W P A $R^{2/3}$ 1.94 V Q

15	160	1340	4.15	"	8.06	10,797.
18	175	1865	4.88	"	9.47	17,660.
20	200	2240	5.05	"	9.8	21,930.



$$Q_{P1} = 20820, \quad D_1 = 19.5 \quad V_1 = \frac{Q \times 1000}{A} = \frac{2140 + 2640}{2} \left(\frac{1000}{43560} \right) = 55 \text{ ft}$$

$$Q_{P2} = 20820 \cdot \left(1 - \frac{55}{1958} \right) = 20235, \quad D_2 = 19.2$$

$$V_0 = \frac{2040 + 2640}{2} () = 54$$

$$Q_{P3} = 20235 \text{ cfs @ Elev. 1751.2}$$

JOB NO 7206.1001
 DATE 7-17-81
 BY WJA
 CH'D BY J. F. C. 153



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SHEET NO D 12
 JOB Dams
 SUBJECT Buckley Dam
 CLIENT COE

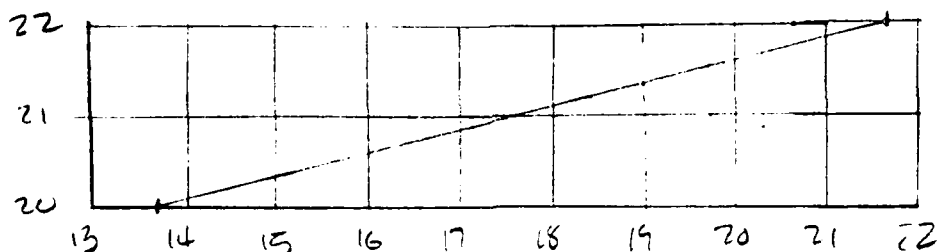
Sta 20+00

$$V = \frac{1.486}{0.110} R^{2/3} (.03)^{1/2} = R^{2/3} 2.574$$

D WP A R^{2/3} 2.57 V Q

20 265 1600. 3.33 " 8.57 13,716.

22 310 2175. 3.68 " 9.48 20,619.



$$Q_{P_1} = 20235 \quad D_1 = 21.65 \quad Vol_1 = \frac{2100 + 2075}{2} \left(\frac{1000}{435.2} \right) = 48.$$

$$Q_{P_2} = 20235 \left(1 - \frac{48}{1958} \right) = 19,738. \quad D_2 = 21.5$$

$$Vol_2 = \frac{2100 + 2031}{2} () = 47.$$

$$Q_{P_3} = 19,738. \quad D = 21.5$$

$$ELEV = 1727.5$$

JOB NO. 19206-1001
 DATE 7-20-81
 BY MJA
 CHD BY 5-20-81



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SHEET NO D 13
 JOB Dennis
 SUBJECT B-D
 CLIENT COE

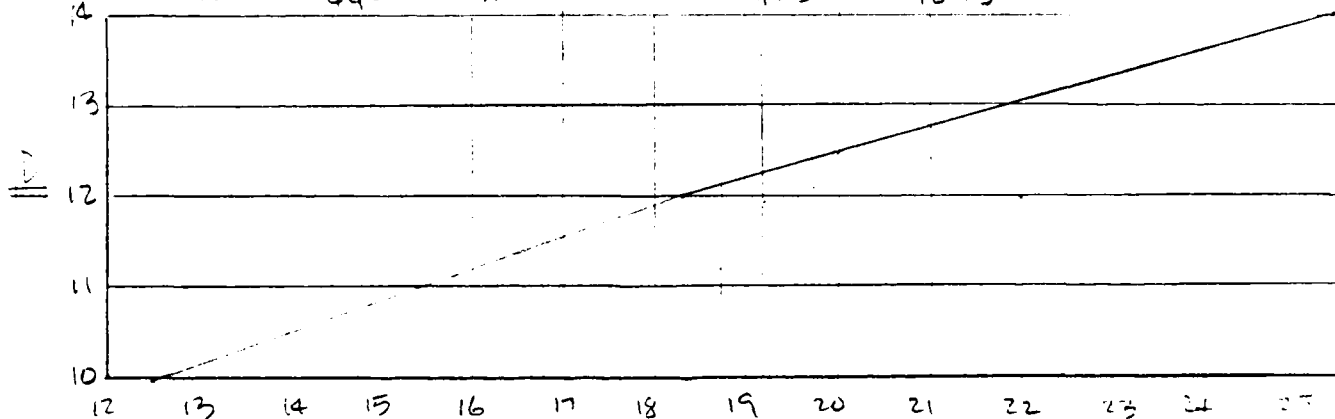
Sta 40+00

$Q_1 = 19738$

$$V = \frac{1.486}{0.10} R^{2/3} (0.0225)^{1/2} = R^{2/3} 2.23$$

D WP A R^{2/3} "2.23" V Q

17	325	3520	4.93	2.23	11.0	38681.
12	265	2070	3.96	"	8.8	18298.
14	295	2630	4.33	"	9.65	25400
10	235	1570	3.57	"	8	12500
6	135	140	1.02	"	2.29	320
3	165	440	1.93	"	4.3	1893



$$Q_{p1} = 19,738 \quad D_1 = 12.4 \quad V_{11} = \frac{2075 + 2200}{2} \left(\frac{2000}{97500} \right) = 98.5$$

$$Q_{p2} = 19738 \left(1 - \frac{98}{1958} \right) = 18750 \quad V_2 = 12.1$$

$$Vol_2 = \frac{2075 + 2100}{2} () = 96$$

$$Q_{p3} = 19,738 \cdot \left(1 - \frac{97.1}{1958} \right) = 18760 \quad D_3 = 12.1$$

$$EL_{2.5} = 1655.10$$

JOB NO 79.206.1001
 DATE 7-20-47
 BY WJA
 CH'D BY J. F. ...



HAYDEN, HARDING & BUCHANAN, INC
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SHEET NO D 14
 JOB Demo
 SUBJECT B-D
 CLIENT CCE

Sta 70+00

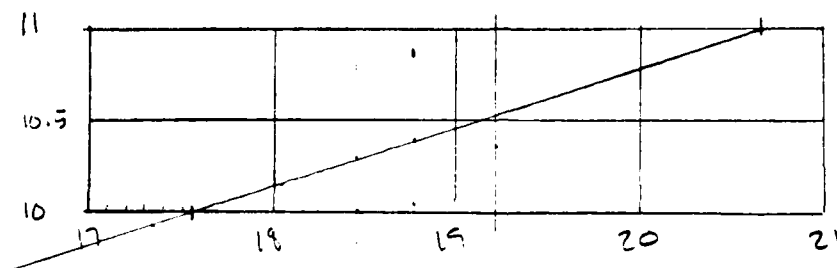
$$Q_{P1} = 18760.$$

$$V = \frac{1.486}{0.10} R^{2/3} (0.03)^{1/2} = R^{2/3} (2.57) \checkmark$$

D WY A R^{2/3} " " V Q

10 325 2010 3.39[✓] 2.57[✓] 8.72[✓] 17537[✓]

11 380 2363 3.4[✓] " " 8.74[✓] 20661[✓]



$$Q_{P1} = 18760 \quad D_1 = 10.4 \checkmark \quad V_{01} = \frac{2100 + 2151}{2} \left(\frac{2030}{43560} \right) \approx 14 \checkmark$$

$$Q_{P2} = 18760 \left(1 - \frac{147}{1958} \right) = 17,352 \checkmark \quad D_2 = 9.9 \checkmark$$

$$V_{02} = \frac{2100 + 1980}{2} \left(\frac{3000}{43560} \right) = 141 \checkmark$$

$$Q_{P3} = 18760 \left(1 - \frac{144}{1958} \right) = 17,380 \checkmark \quad E_{120} = 1589.9 \checkmark$$

$$D_3 = 9.9$$

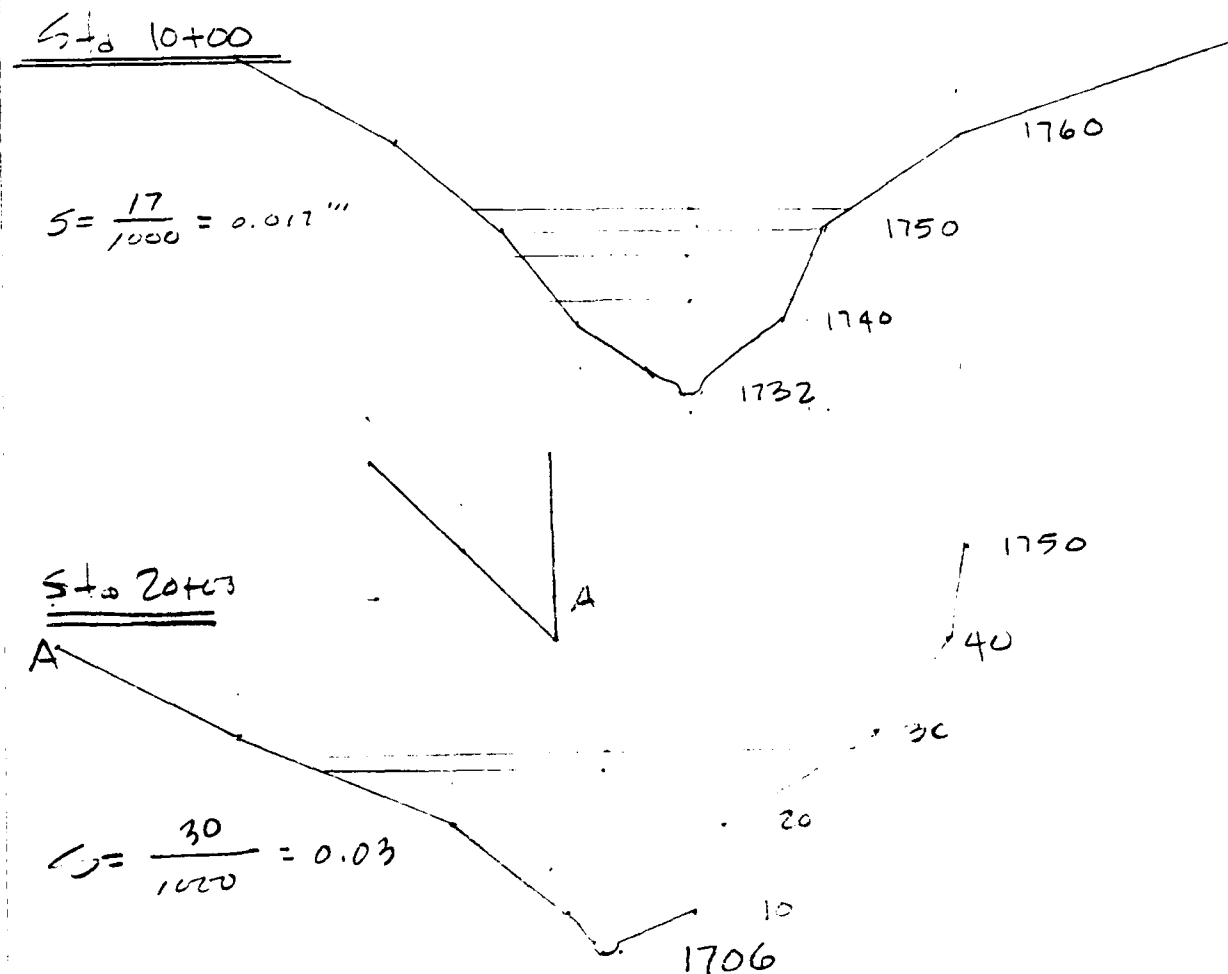
JOB NO 79,206,1001
 DATE 7-16-21
 BY W/A
 CH'D BY _____



HAYDEN, HARDING & BUCHANAN, INC.
 CONSULTING ENGINEERS
 BOSTON — WEST HARTFORD

SHEET NO D 15

JOB Dune
 SUBJECT Wachem Dune
 CLIENT CE



JOB NO 79206.1001
 DATE 7-20-81
 BY WJA
 CH'D BY _____

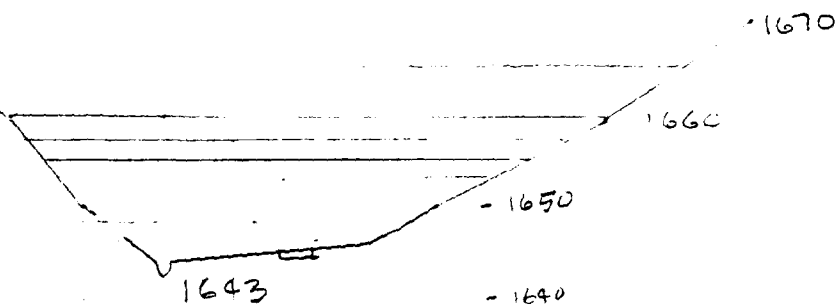


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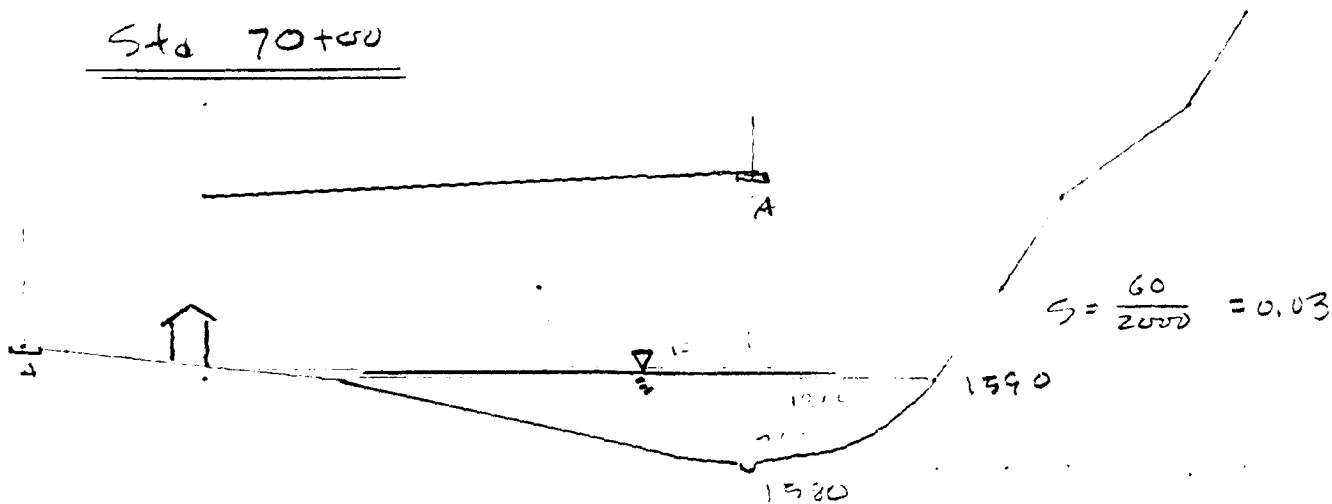
SHEET NO D 16
 JOB Damg
 SUBJECT P-0
 CLIENT COE

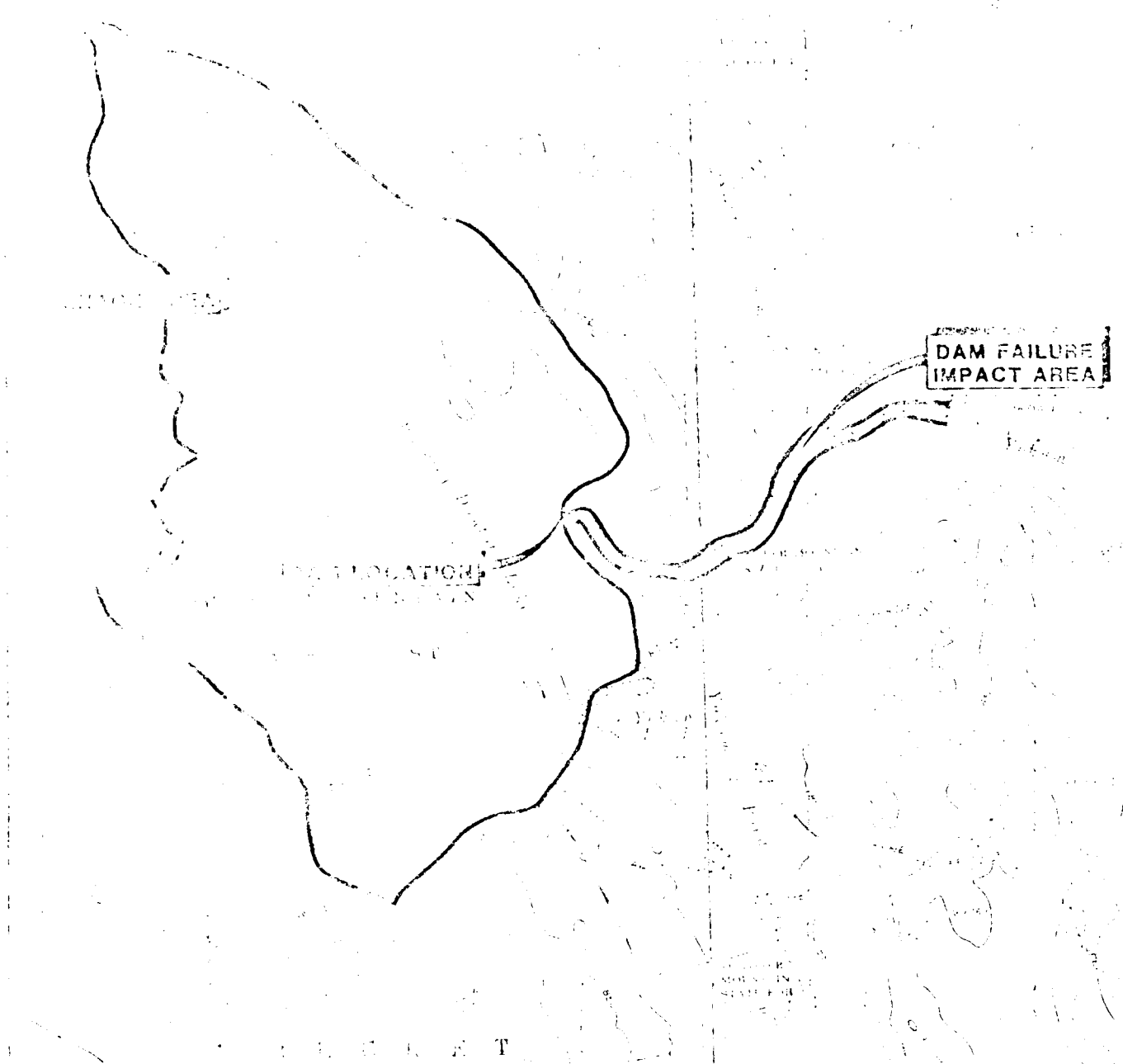
Sta 40+00

$$S = \frac{45}{2000} = .0225$$



Sta 70+00





<p>BRIDEN, HARDING & RICHANAN, INC. CONSULTING ENGINEERS 100 N. MAIN ST. STE. 100 BOSTON, MASS. 02108</p>	<p>U.S. ARMY ENGINEER DIV. NEW ENGLAND CHIEF OF ENGINEERS 300 STATE ST. BOSTON, MASS. 02108</p>
<p>NATIONAL PROGRAM OF INSPECTION OF NON F.E.D. DAMS</p>	
<p>BUCKLEY-DUNTON DAM DAM FAILURE IMPACT & DRAINAGE AREAS</p>	
<p>DATE: 10/17/68</p>	<p>MAP SCALE: 1" = 1 MILE</p>

APPENDIX E

INFORMATION AS CONTAINED IN THE
NATIONAL INVENTORY OF DAMS

END

FILMED

7-85

DTIC